0622T THES260

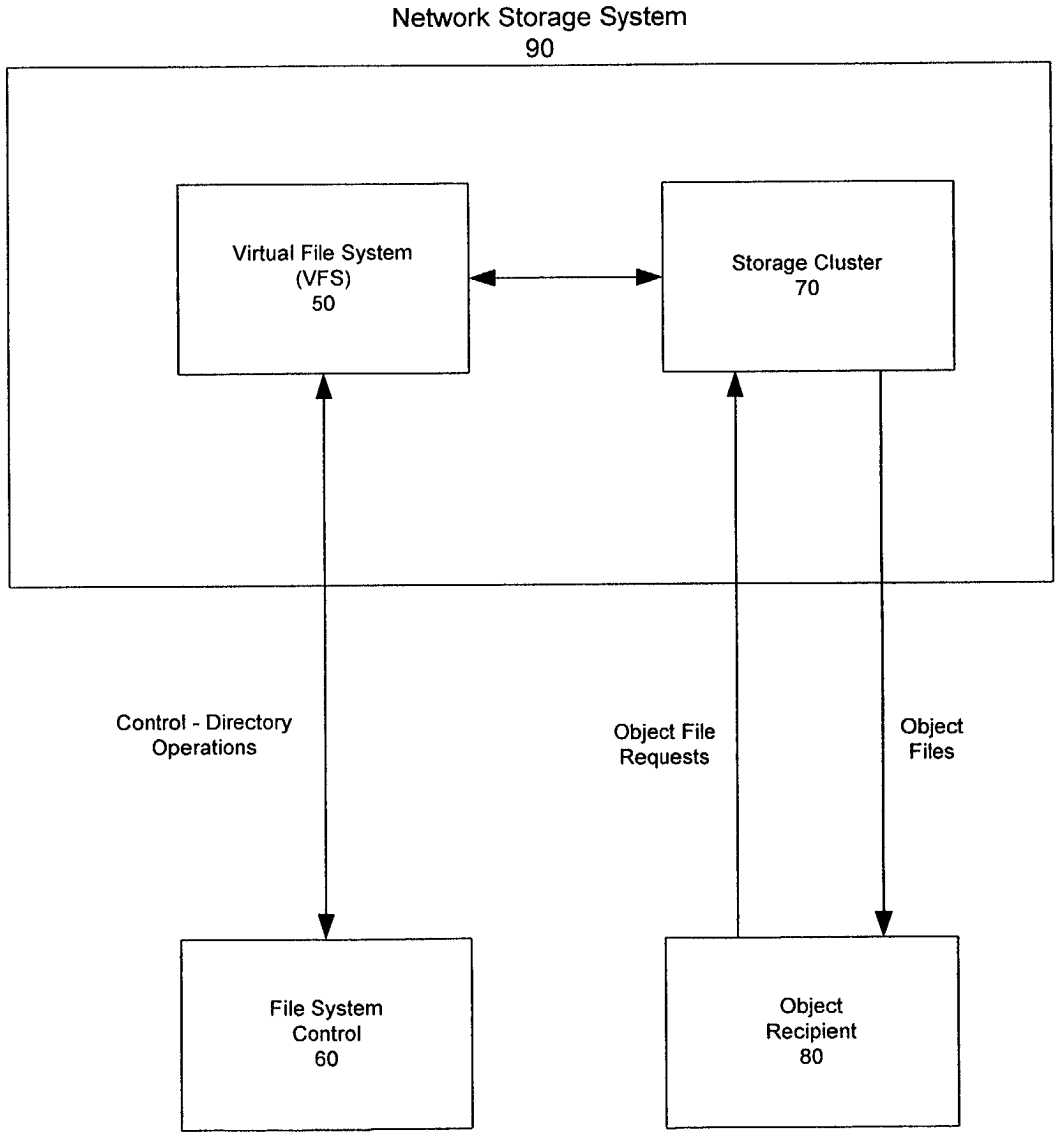


Figure 1

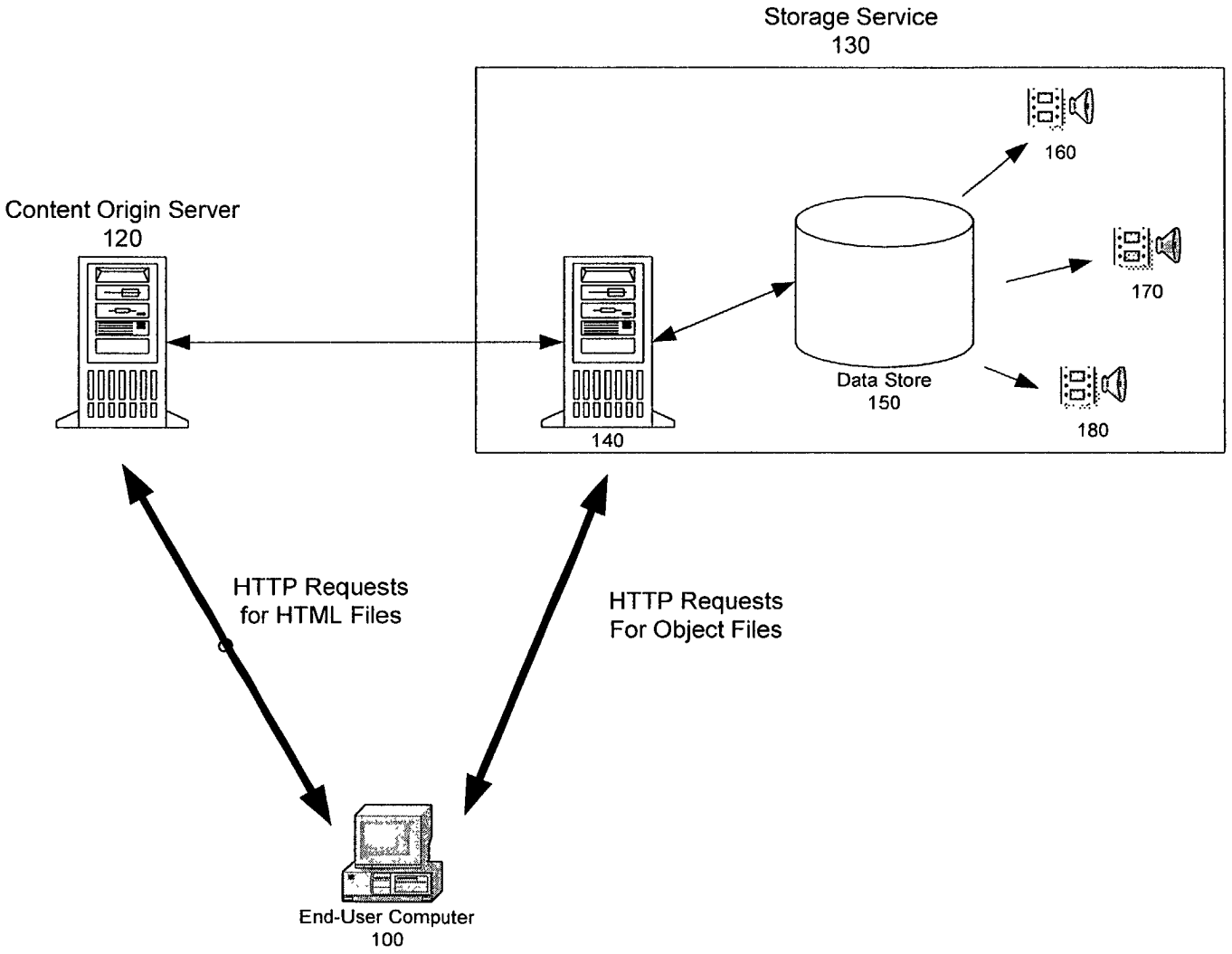

Storage Service
130
160
Content Origin Server
120
170
Data Store
150
140
180
HTTP Requests
for HTML Files
HTTP Requests
For Object Files
End-User Computer
100

Figure 2

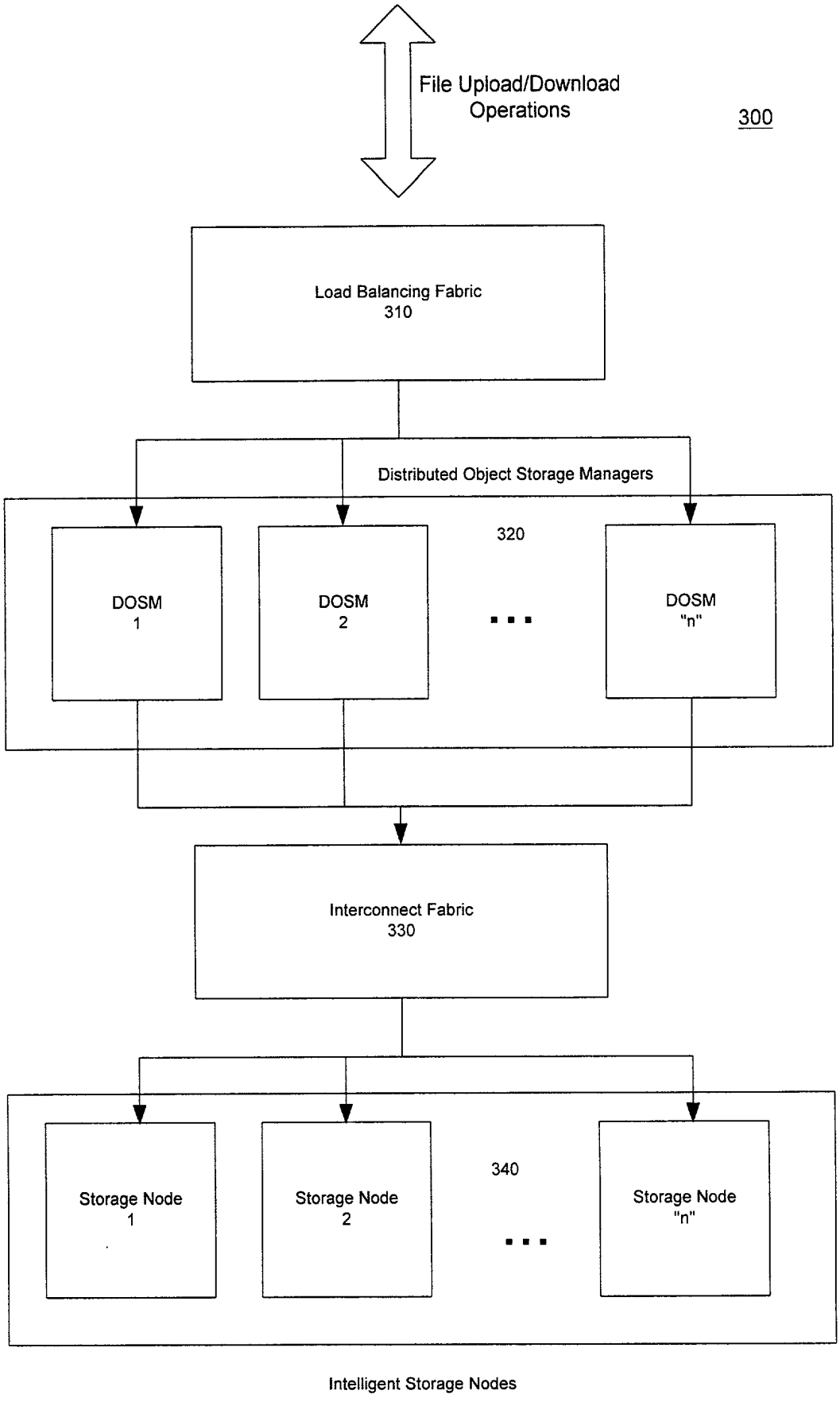

File Upload/Download Operations
300
Load Balancing Fabric
310
Distributed Object Storage Managers
320
DOSM
1
DOSM
2
DOSM
"n"
Interconnect Fabric
330
340
Storage Node
1
Storage Node
2
Storage Node
"n"
Intelligent Storage Nodes

Figure 3

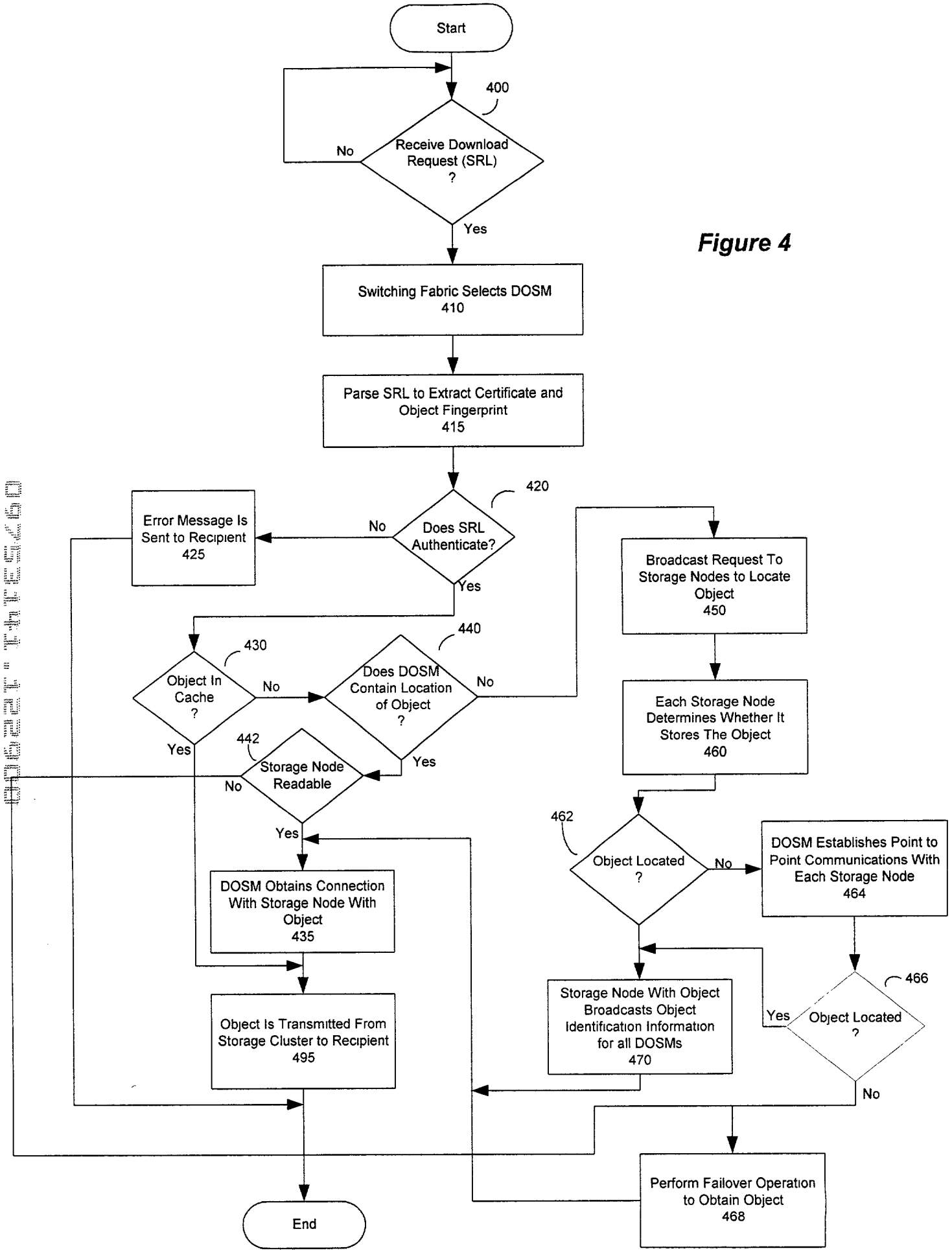

Start
400
Receive Download Request (SRL) ?
No
Yes
Switching Fabric Selects DOSM 410
Parse SRL to Extract Certificate and Object Fingerprint 415
420
Does SRL Authenticate?
No
Error Message Is Sent to Recipient 425
Yes
430
Object In Cache ?
No
440
Does DOSM Contain Location of Object ?
No
Yes
442
Storage Node Readable
No
Yes
DOSM Obtains Connection With Storage Node With Object 435
Object Is Transmitted From Storage Cluster to Recipient 495
End
Broadcast Request To Storage Nodes to Locate Object 450
Each Storage Node Determines Whether It Stores The Object 460
462
Object Located ?
No
DOSM Establishes Point to Point Communications With Each Storage Node 464
466
Yes
Object Located ?
No
Storage Node With Object Broadcasts Object Identification Information for all DOSMs 470
Perform Failover Operation to Obtain Object 468

Figure 4

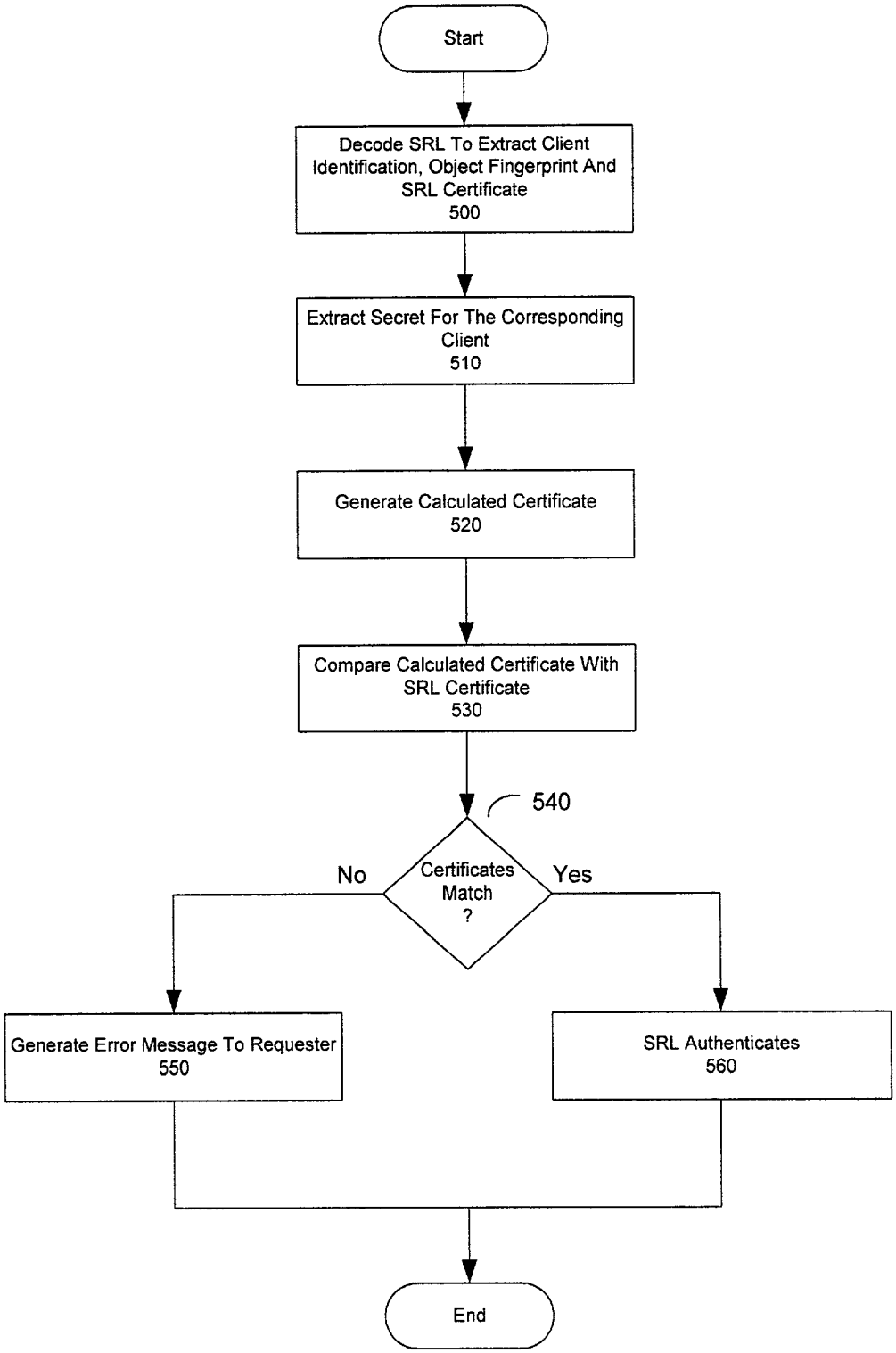
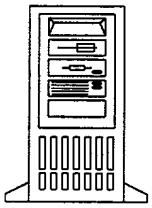

Start
Decode SRL To Extract Client Identification, Object Fingerprint And SRL Certificate
500
Extract Secret For The Corresponding Client
510
Generate Calculated Certificate
520
Compare Calculated Certificate With SRL Certificate
530
540
Certificates Match ?
No
Yes
Generate Error Message To Requester
550
SRL Authenticates
560
End

Figure 5

0975-1141-1220900

DOSM File Look-up Table
610

File Id	IP Addr	Disk Id
file1.MD5	10.3.100.1	3
file2.MD5	10.3.098.1	1
file3.MD5	10.3.050.1	6
file4.MD5	10.3.100.1	2
file5.MD5	10.3.098.1	1
file6.MD5	10.3.050.1	8



DOSM Server
600

Data Cache
620

Film Snippet

Advertisement

Film Preview

State Table
630

Read - Write State of Storage Nodes
Health of Storage Nodes
Load of Storage Nodes - Storage Capacity - Number of I/O Operations Per Second

Figure 6

006227 "EXPRESS60

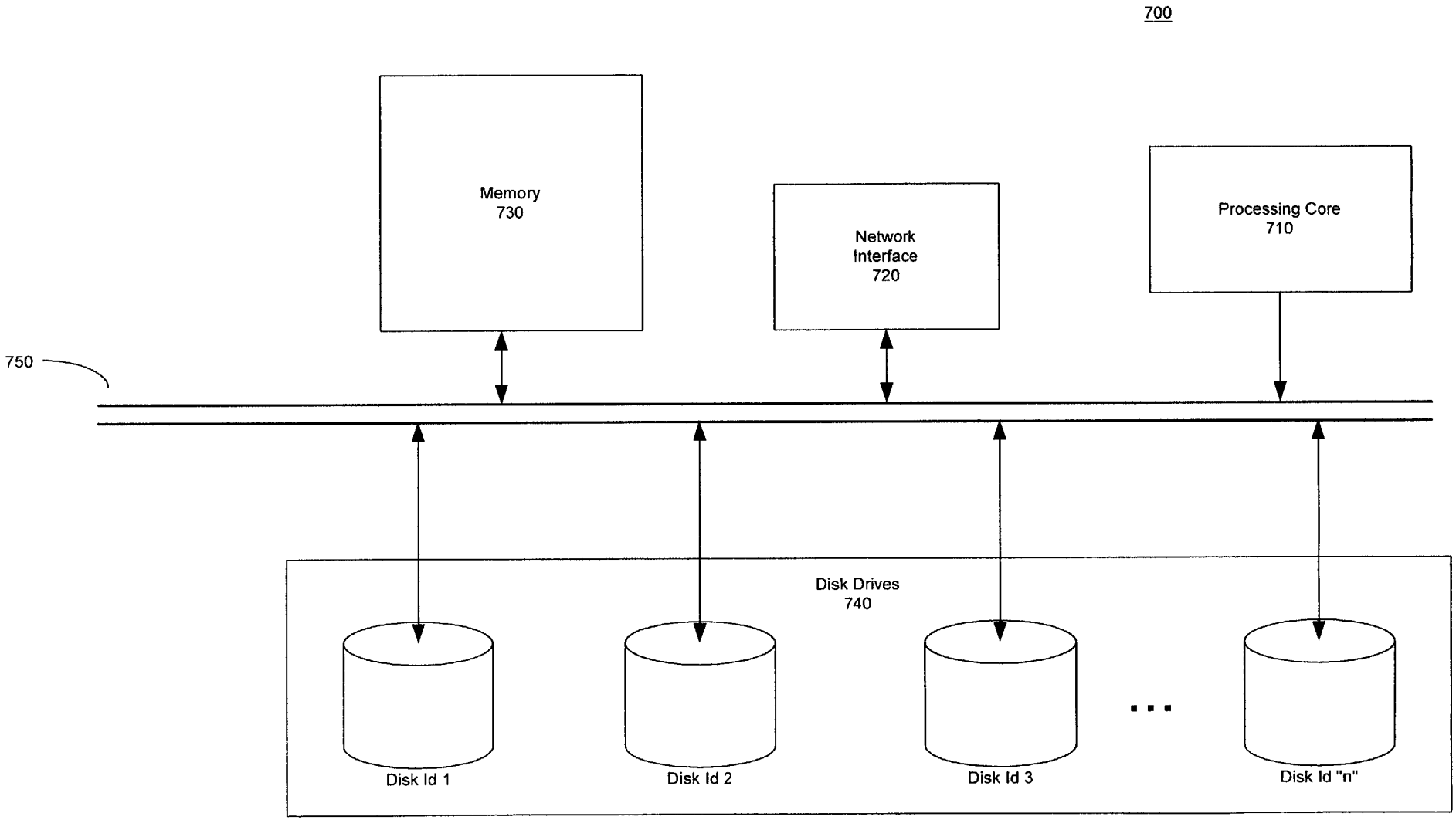


Figure 7

09534447.032900

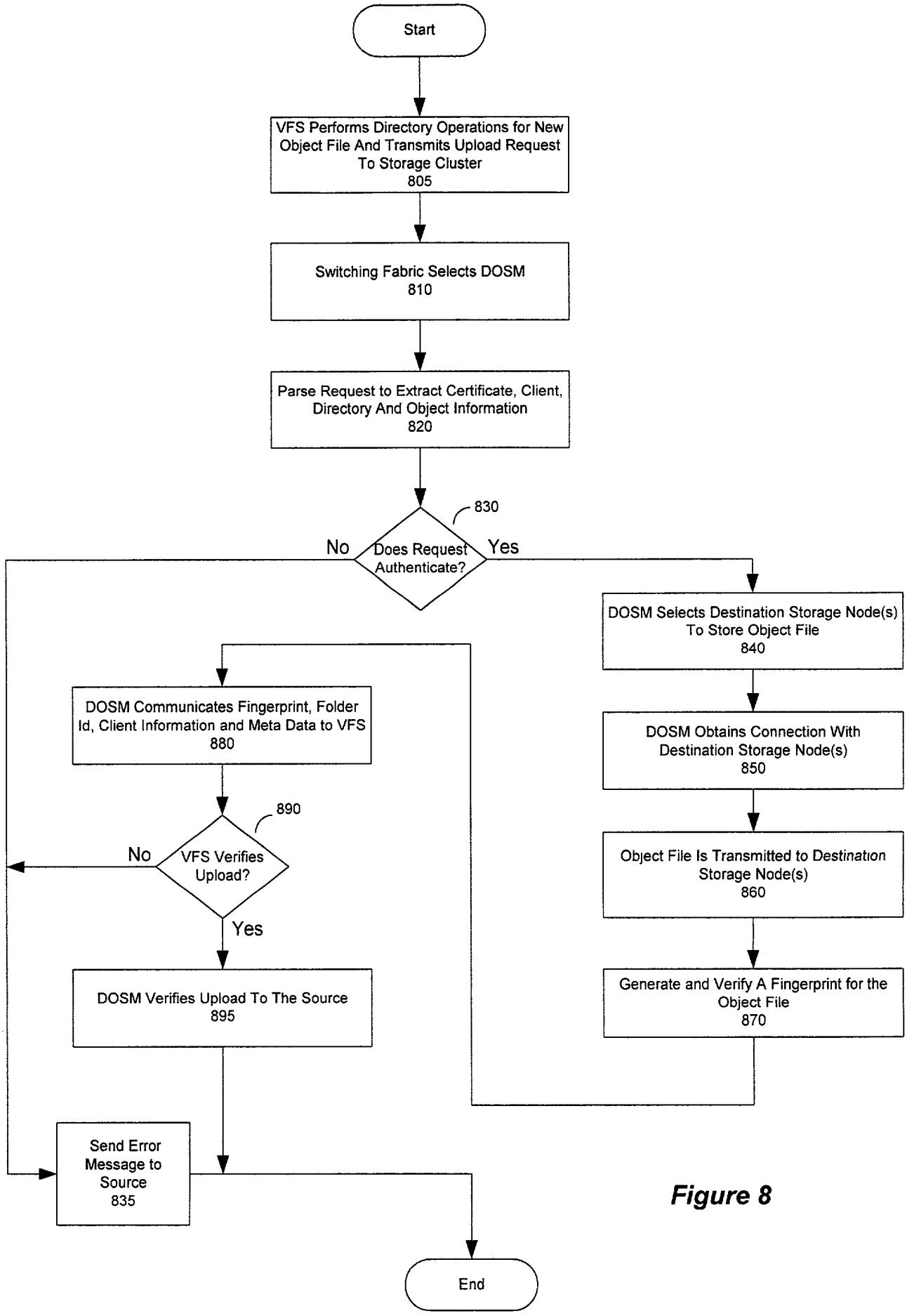


Figure 8

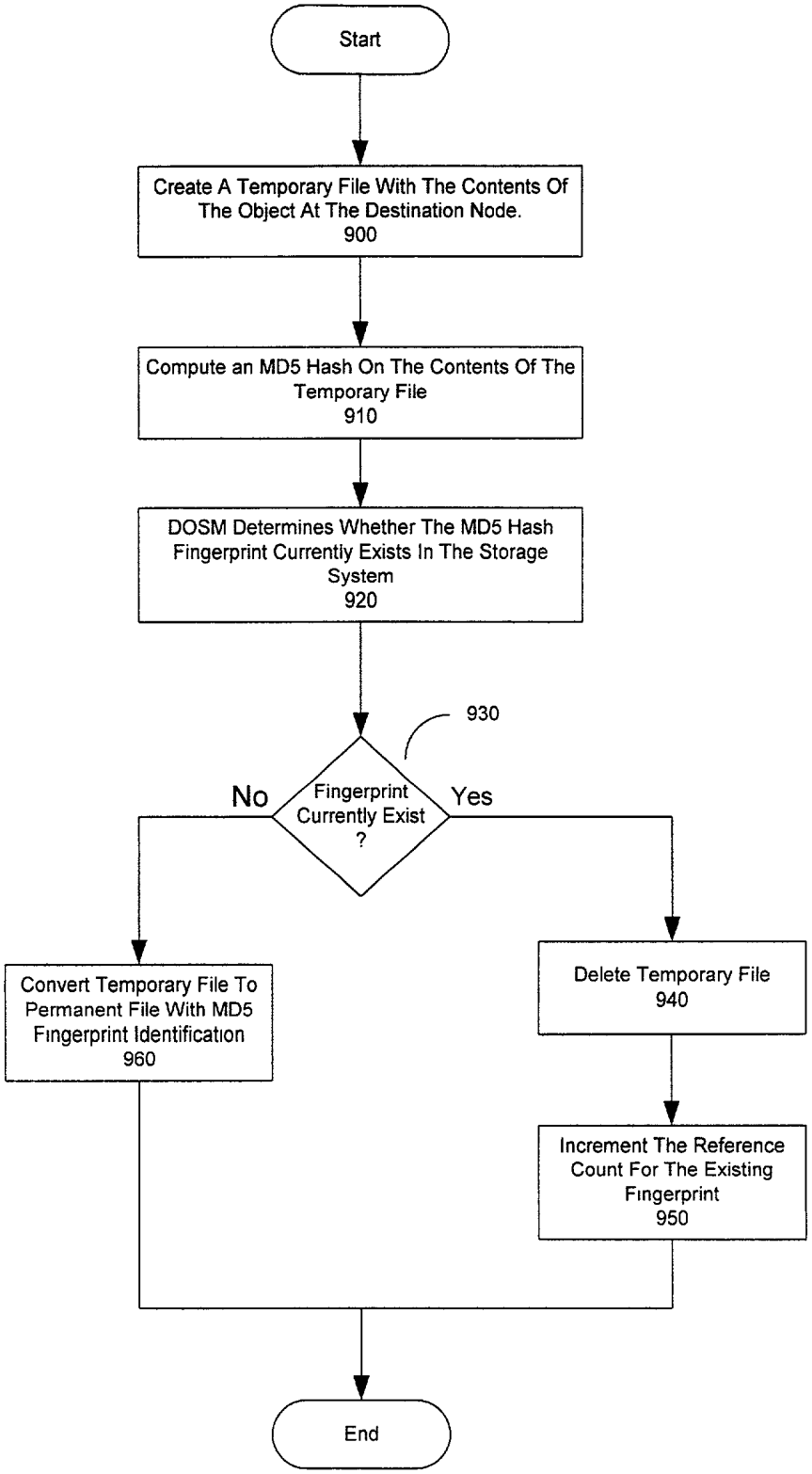

Start
Create A Temporary File With The Contents Of The Object At The Destination Node.
900
Compute an MD5 Hash On The Contents Of The Temporary File
910
DOSM Determines Whether The MD5 Hash Fingerprint Currently Exists In The Storage System
920
930
Fingerprint Currently Exist ?
No
Yes
Convert Temporary File To Permanent File With MD5 Fingerprint Identification
960
Delete Temporary File
940
Increment The Reference Count For The Existing Fingerprint
950
End

Figure 9

00621T" THES260

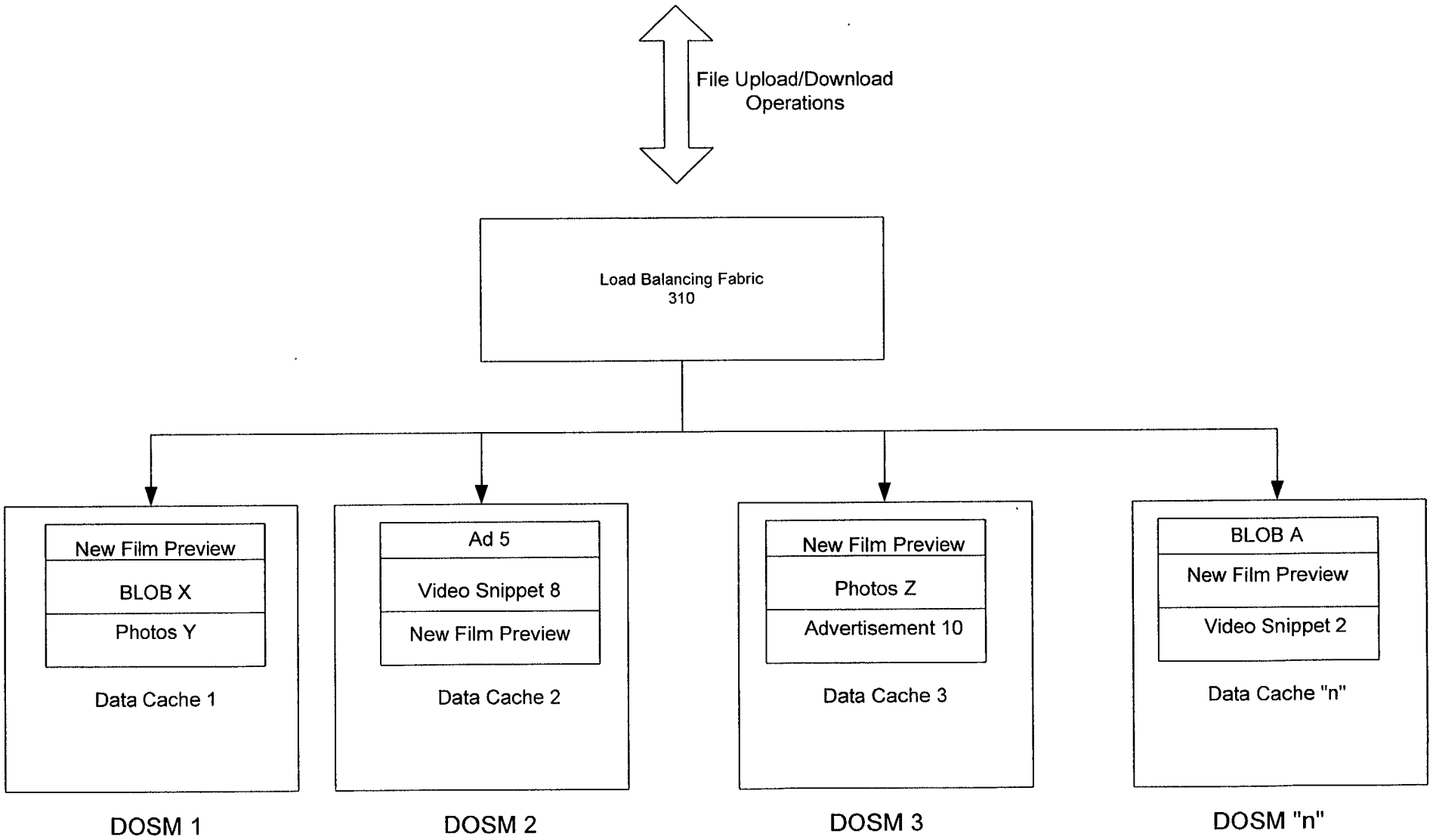


Figure 10

0622F" THES260

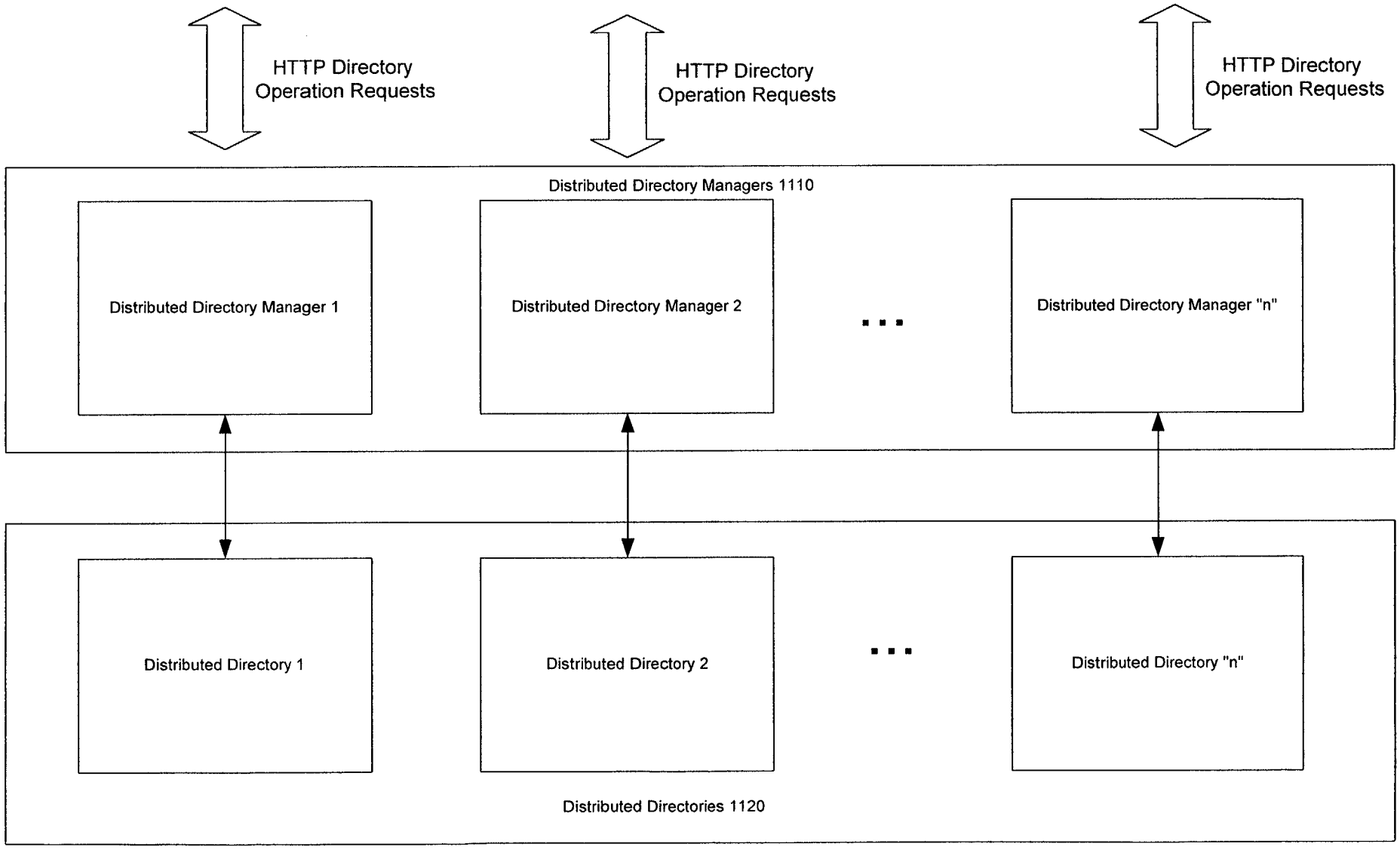


Figure 11

Customer Table

	Customer Name	Customer Reserved Fields
	Customer A	[Customer stores data ...]
	Customer B	[Customer stores data ...]
	Customer C	[Customer stores data ...]
	Customer D	[Customer stores data ...]

1200

Folder Table

Customer Id	Folder Id	Folder Parent Id	Metadata
3	2	-	[Reserved]
3	100	2	[Reserved]
3	251	2	[Reserved]
3	166	251	[Reserved]

1210

File Table

Customer Id	File Handle	Folder Id	Folder Parent Id	Metadata
3	52.MD5	100	2	[Reserved]
3	55.MD5	100	2	[Reserved]
3	99.MD5	166	251	[Reserved]
3	67.MD5	166	251	[Reserved]

1220

Figure 12

Doc-4754-4754-4754

09554141 - 032500

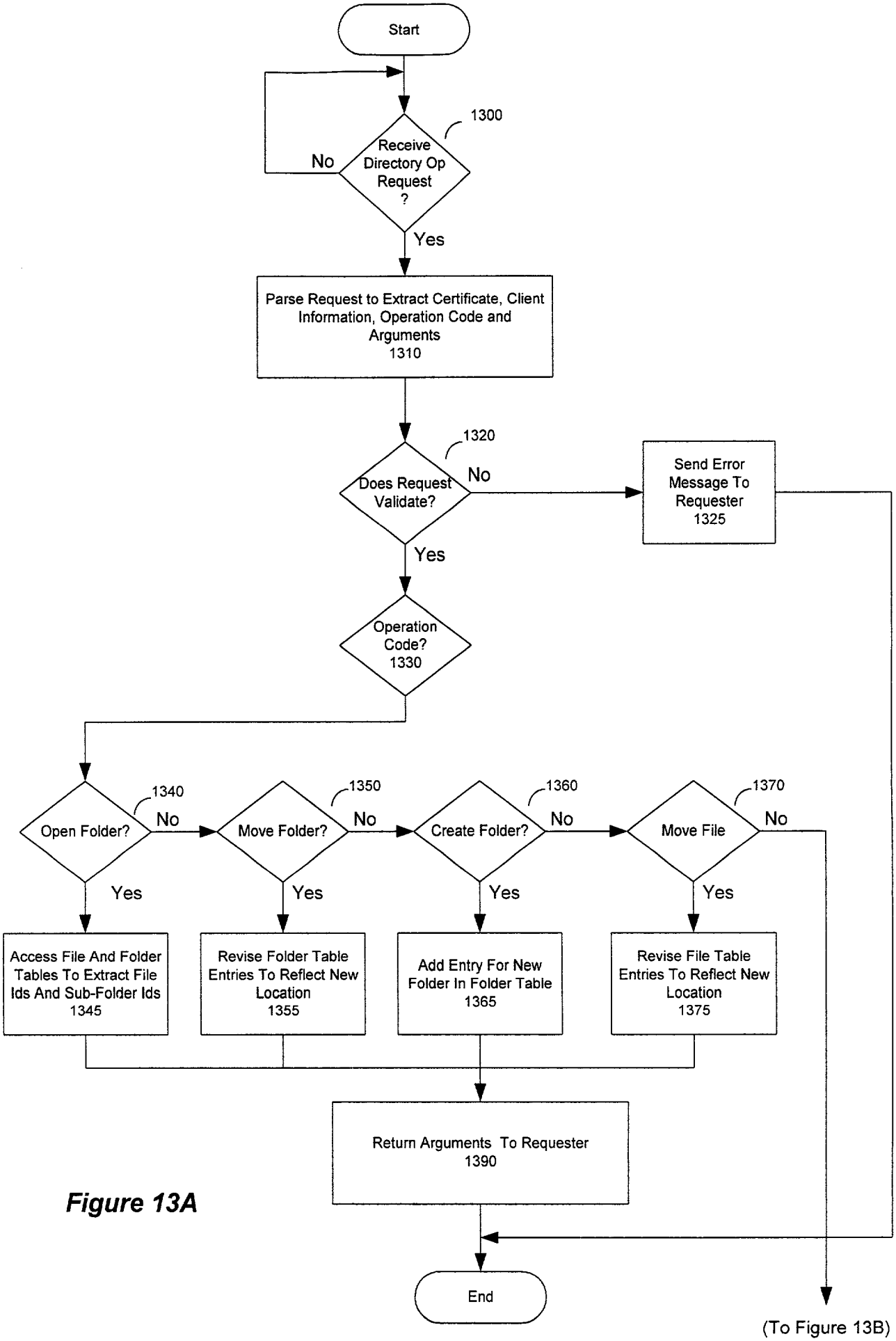


Figure 13A

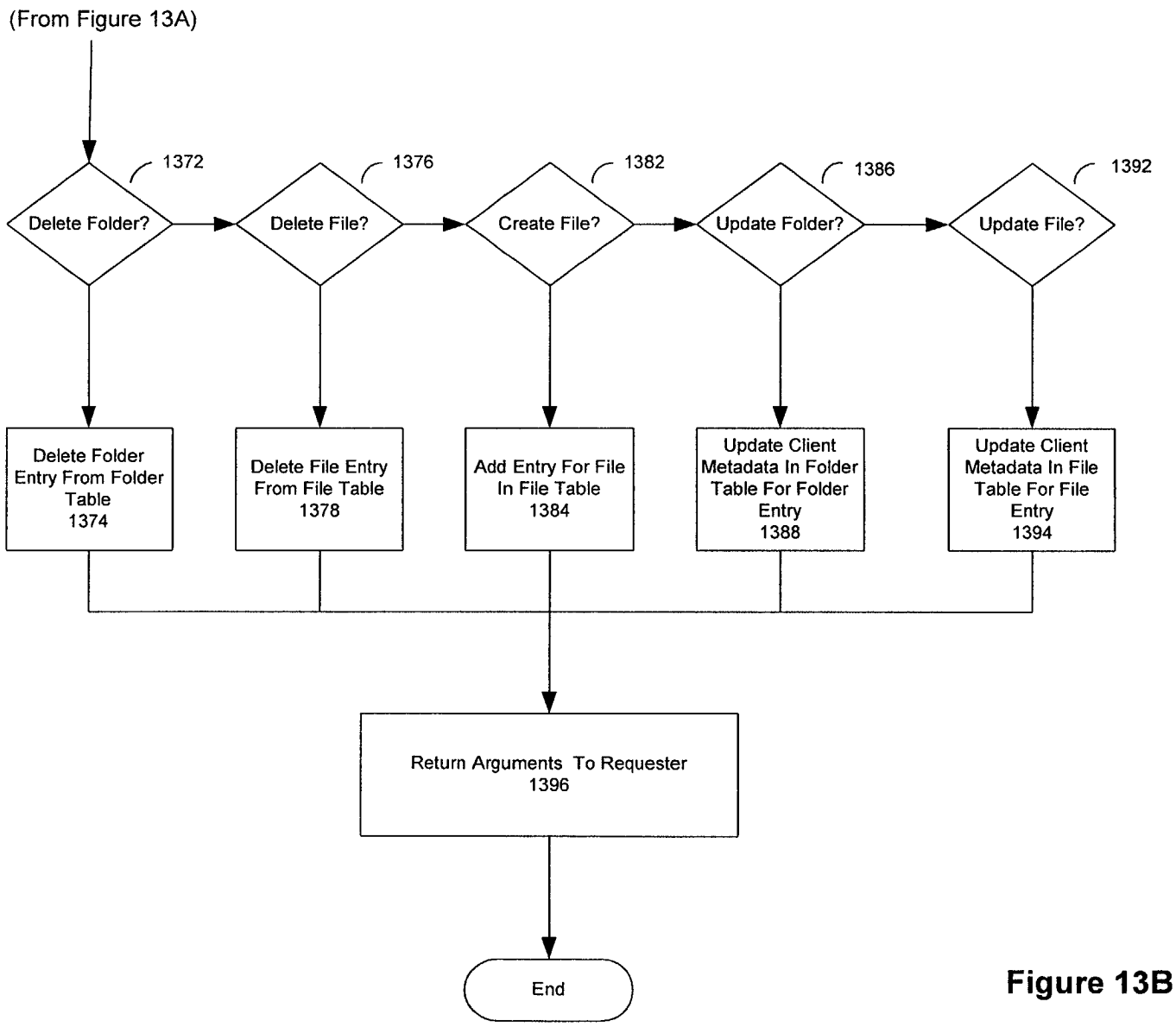

(From Figure 13A)
1372
Delete Folder?
1376
Delete File?
1382
Create File?
1386
Update Folder?
1392
Update File?
Delete Folder Entry From Folder Table 1374
Delete File Entry From File Table 1378
Add Entry For File In File Table 1384
Update Client Metadata In Folder Table For Folder Entry 1388
Update Client Metadata In File Table For File Entry 1394
Return Arguments To Requester 1396
End

Figure 13B

09234456

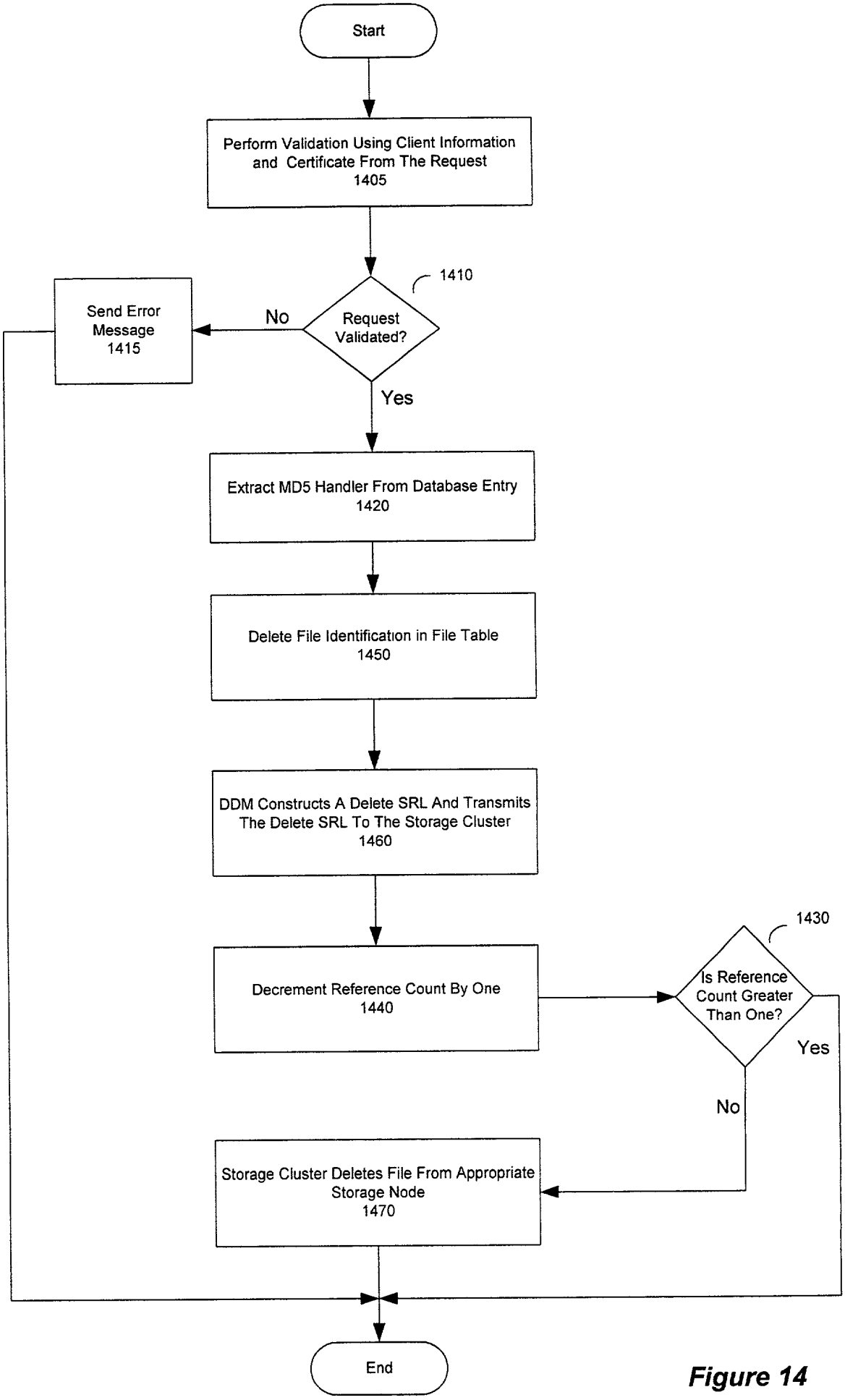


Figure 14

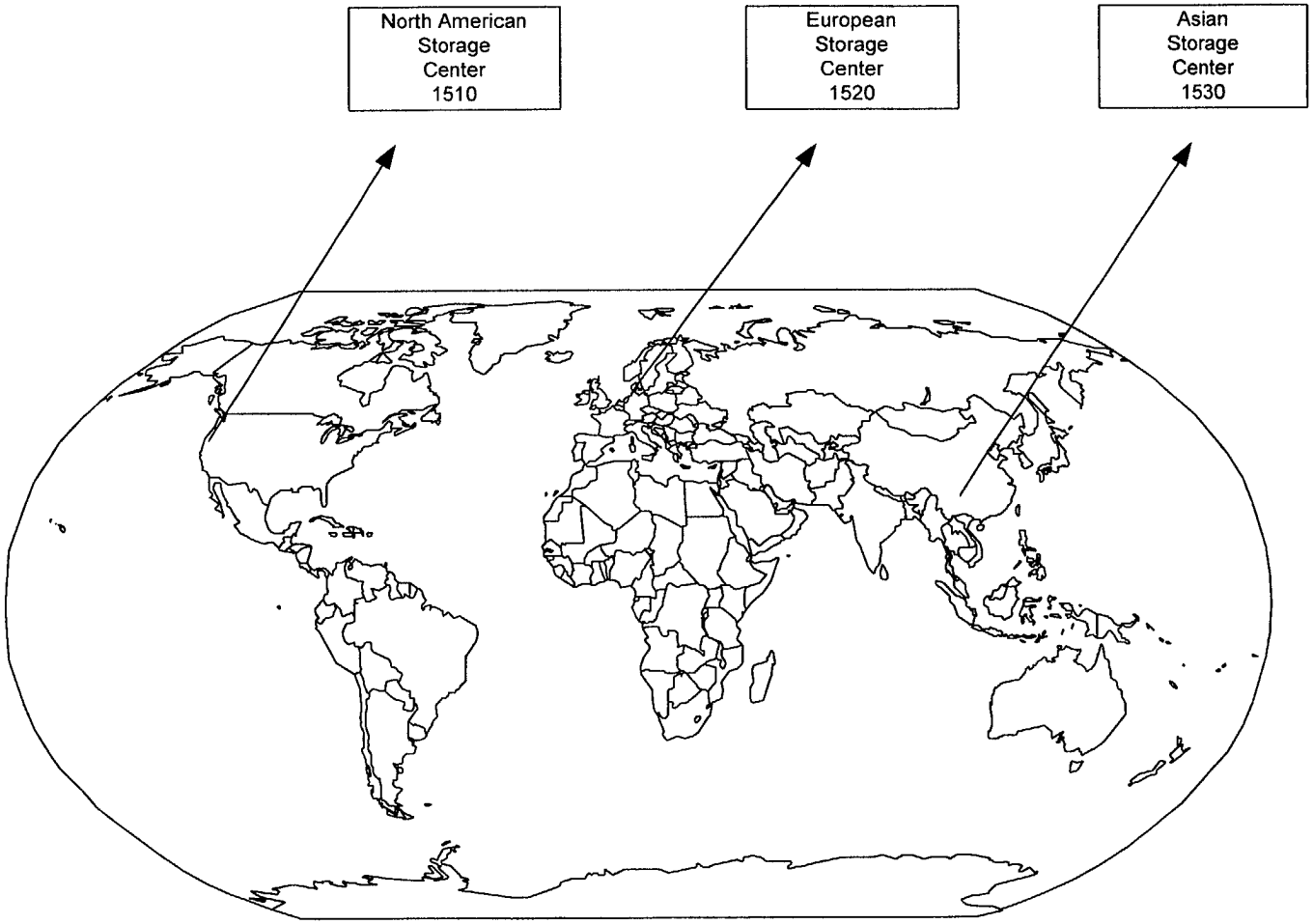

North American
Storage
Center
1510
European
Storage
Center
1520
Asian
Storage
Center
1530

Figure 15

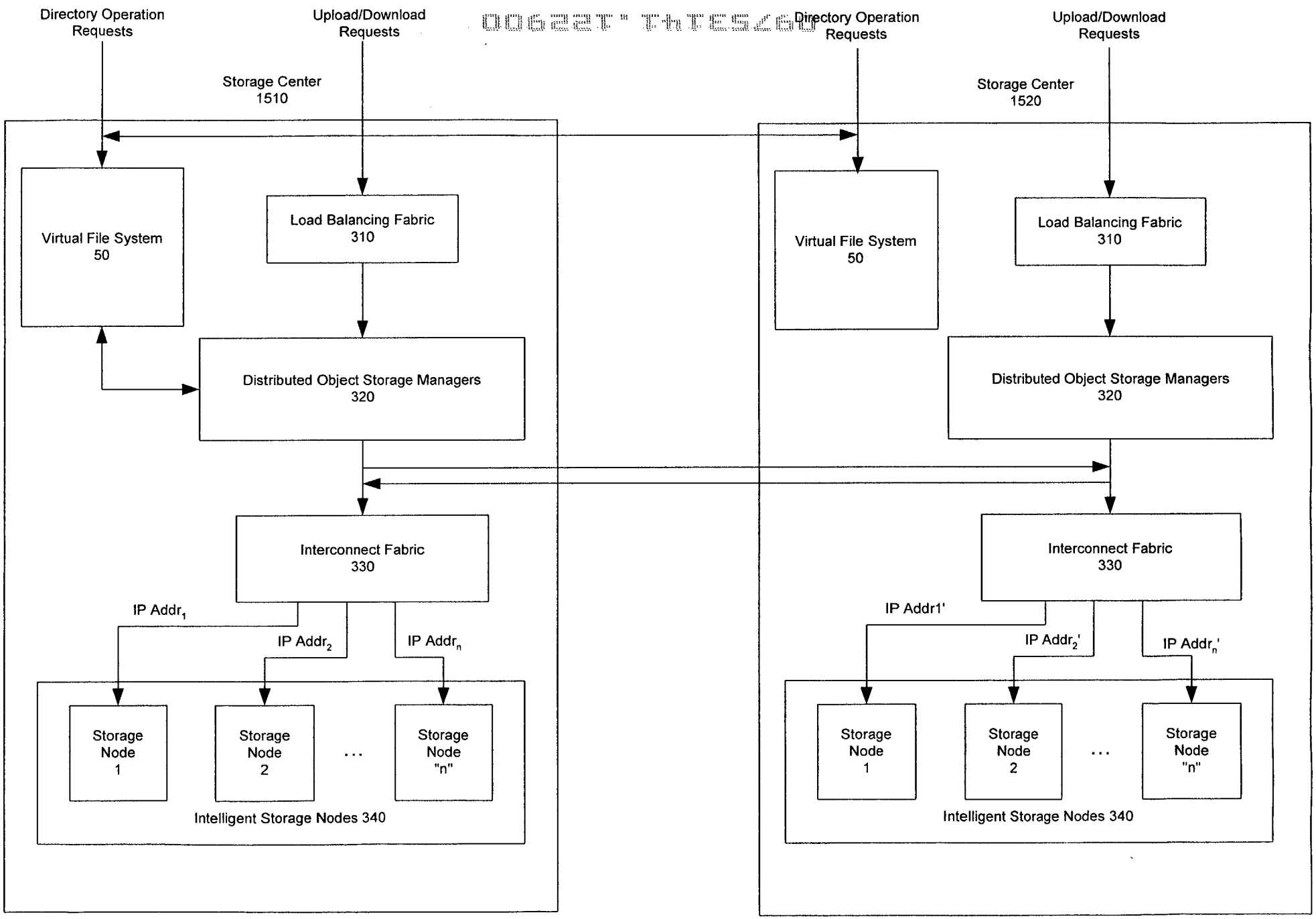

Directory Operation Requests
Upload/Download Requests
Storage Center 1510
Virtual File System 50
Load Balancing Fabric 310
Distributed Object Storage Managers 320
Interconnect Fabric 330
IP Addr1
IP Addr2
IP Addrn
Storage Node 1
Storage Node 2
Storage Node "n"
Intelligent Storage Nodes 340
Directory Operation Requests
Upload/Download Requests
Storage Center 1520
Virtual File System 50
Load Balancing Fabric 310
Distributed Object Storage Managers 320
Interconnect Fabric 330
IP Addr1'
IP Addr2'
IP Addrn'
Storage Node 1
Storage Node 2
Storage Node "n"
Intelligent Storage Nodes 340

Figure 16

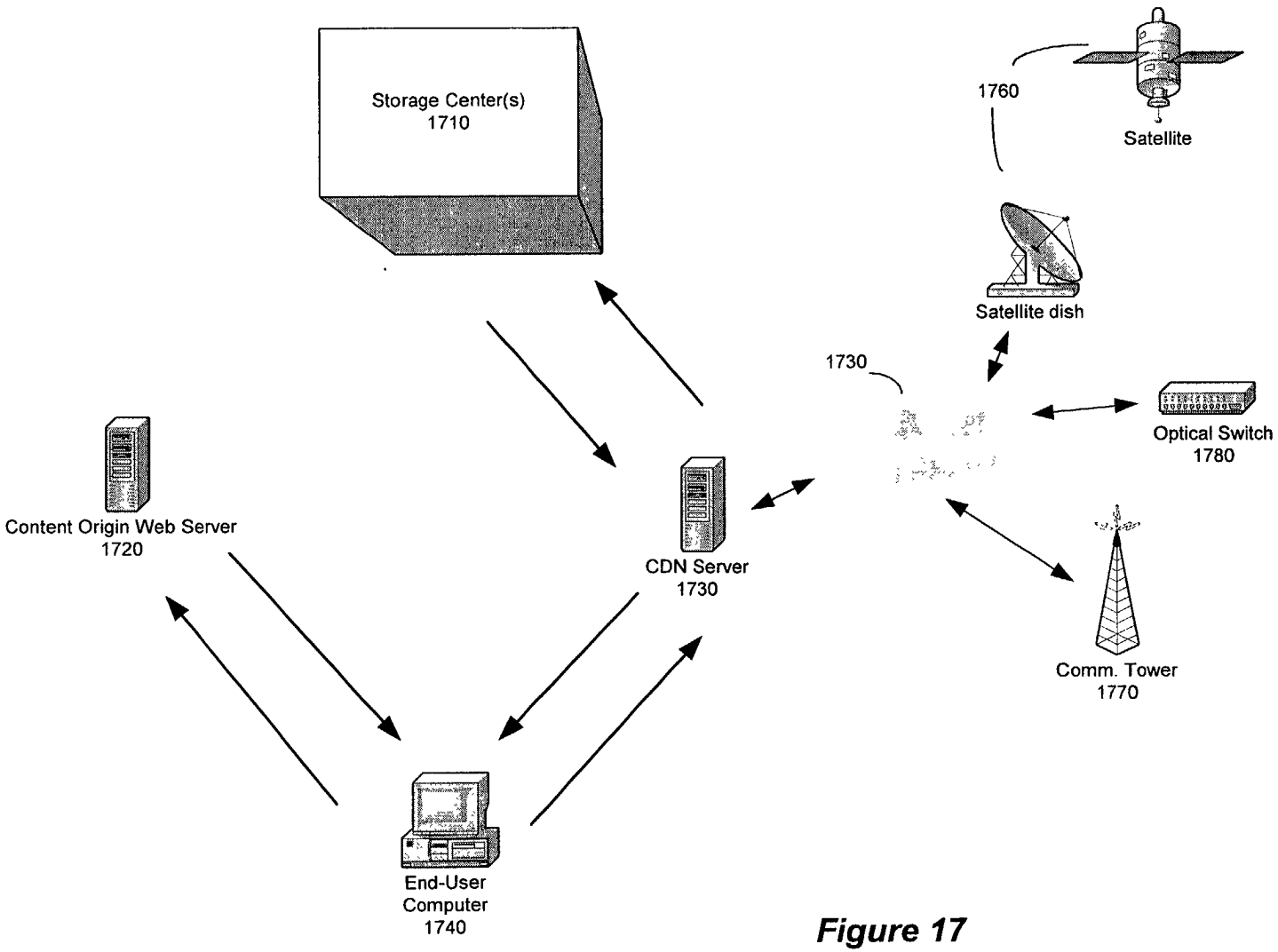

Storage Center(s)
1710
1760
Satellite
Satellite dish
1730
Optical Switch
1780
Content Origin Web Server
1720
CDN Server
1730
Comm. Tower
1770
End-User
Computer
1740

Figure 17

Document - 1125200

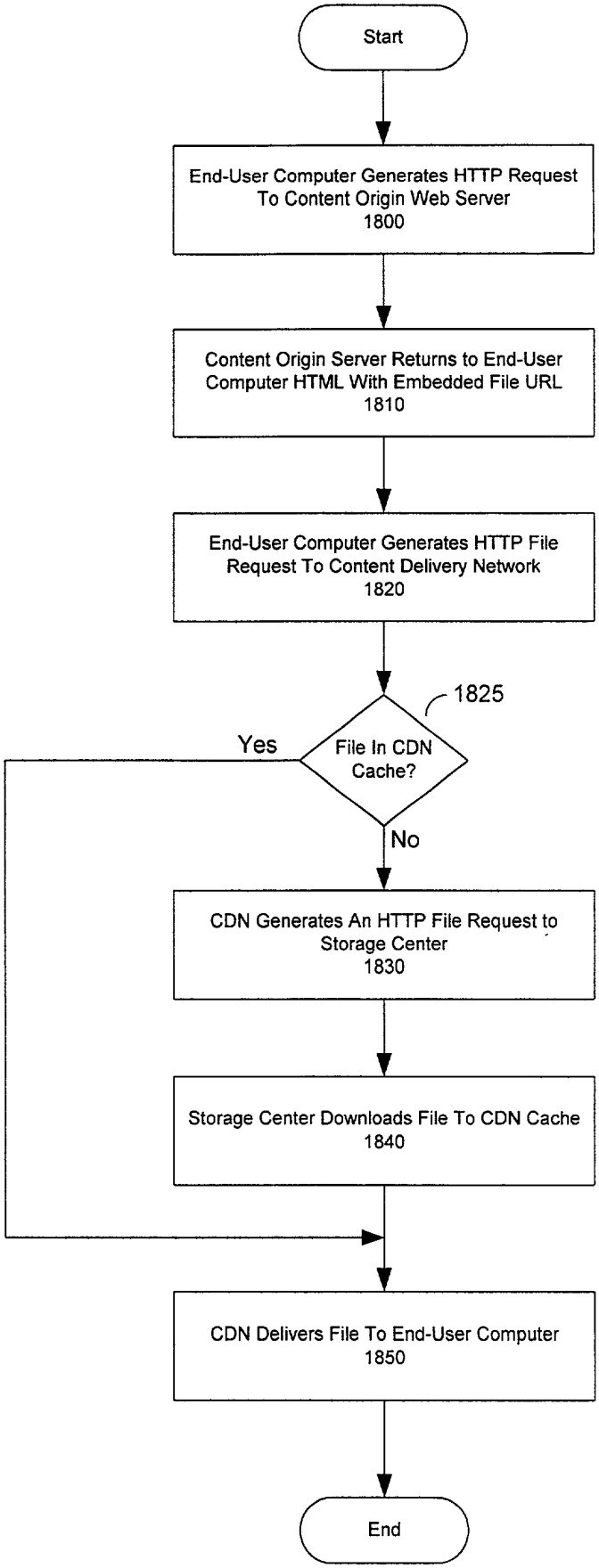


Figure 18

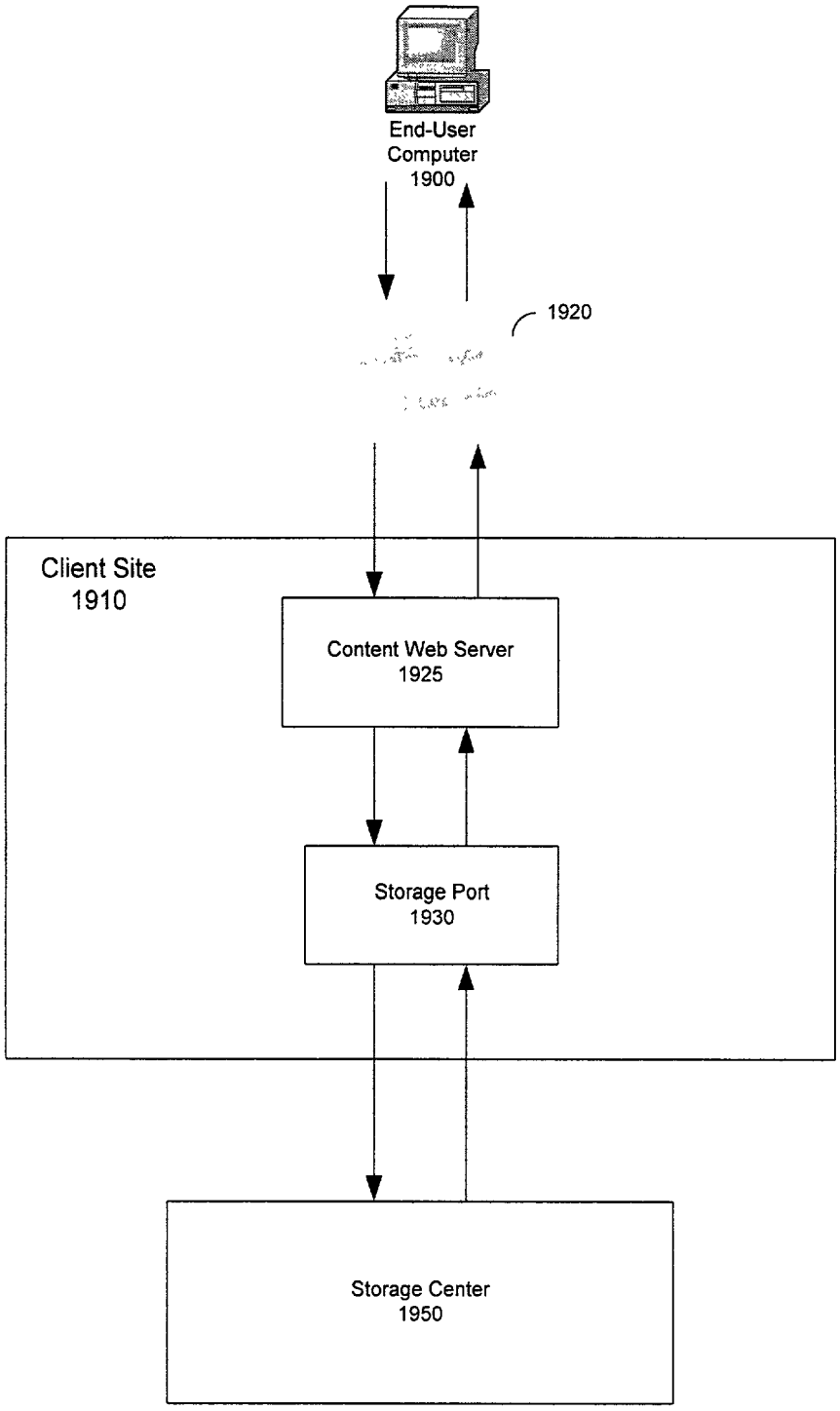

End-User
Computer
1900
1920
Client Site
1910
Content Web Server
1925
Storage Port
1930
Storage Center
1950

Figure 19

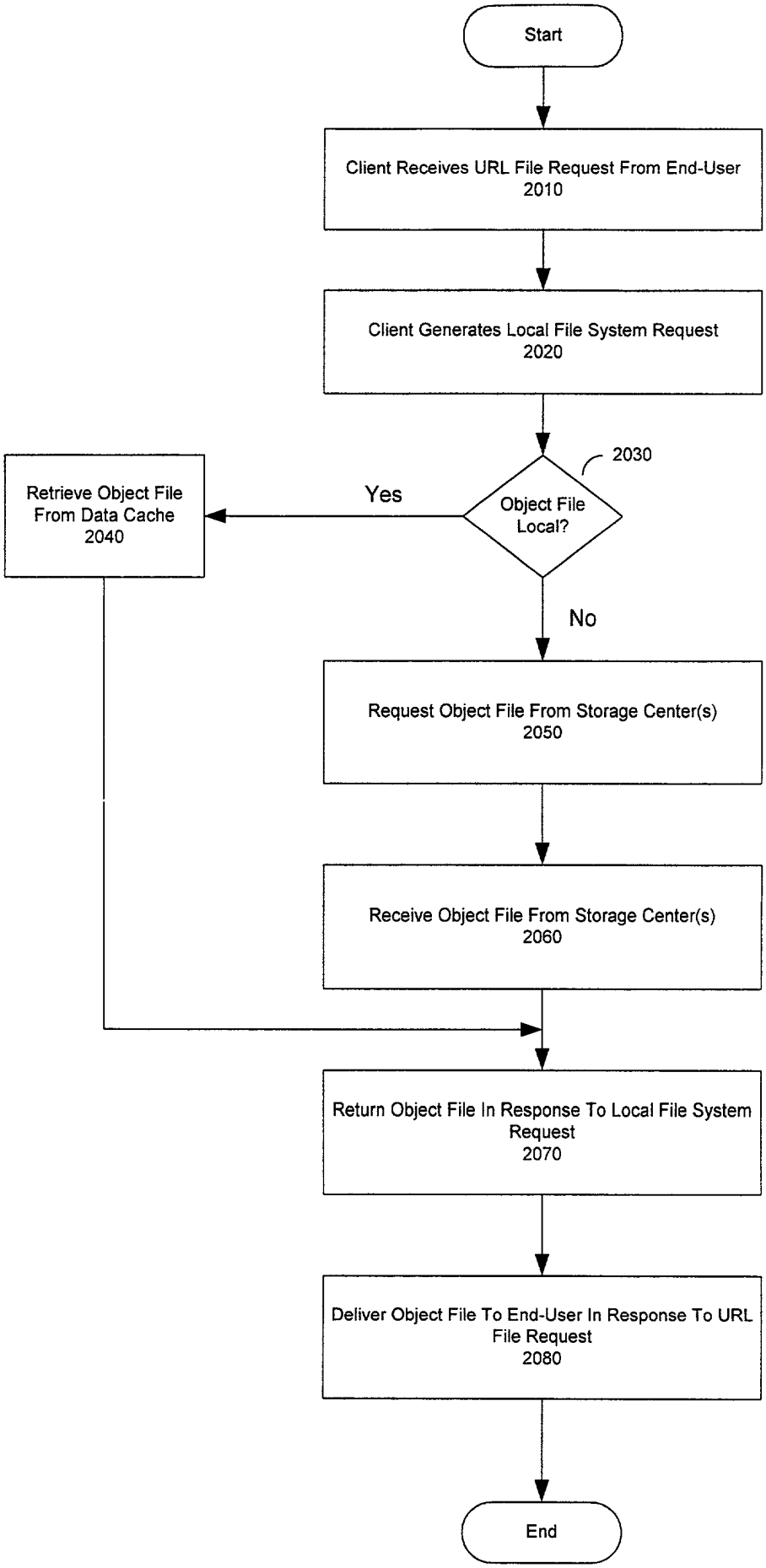

Start
Client Receives URL File Request From End-User
2010
Client Generates Local File System Request
2020
2030
Object File Local?
Yes
Retrieve Object File From Data Cache
2040
No
Request Object File From Storage Center(s)
2050
Receive Object File From Storage Center(s)
2060
Return Object File In Response To Local File System Request
2070
Deliver Object File To End-User In Response To URL File Request
2080
End

Figure 20

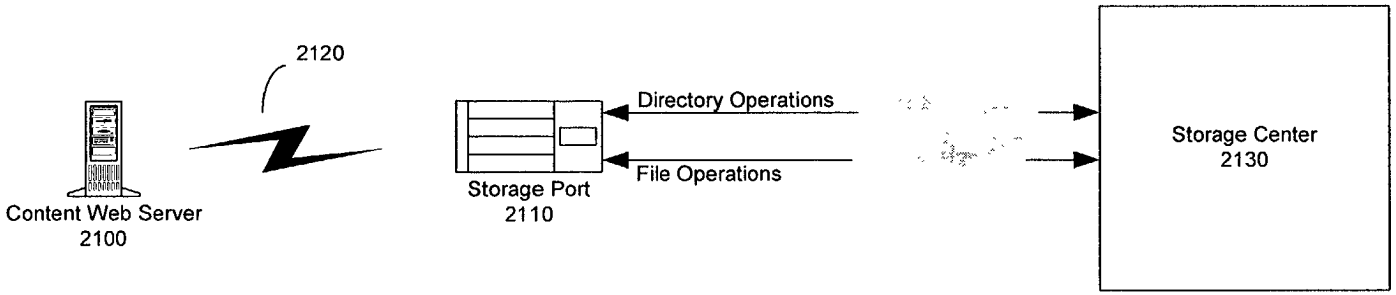


Figure 21a

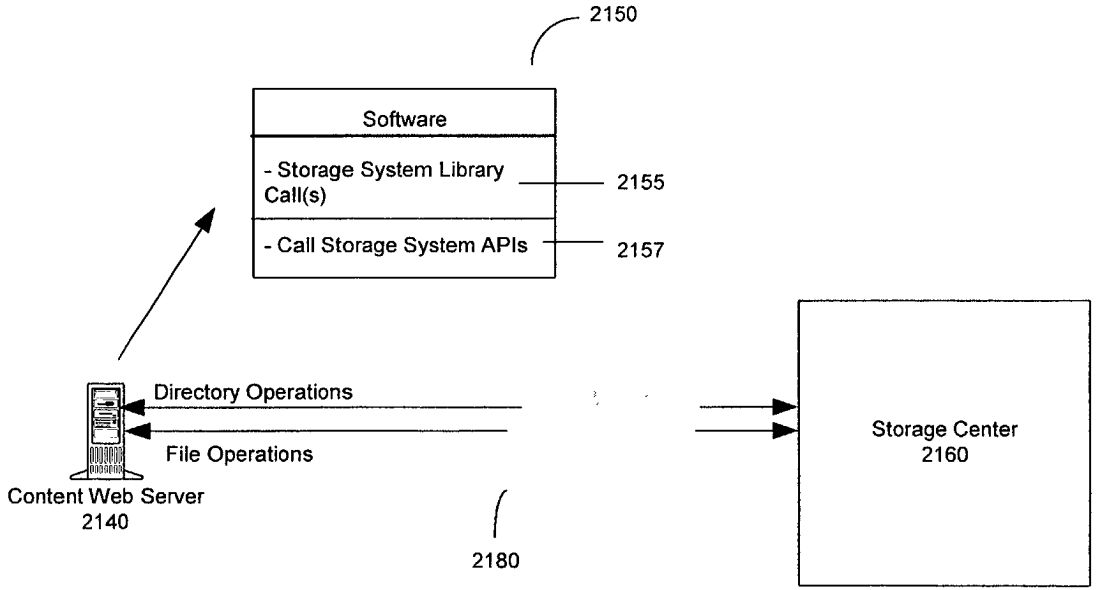


Figure 21b

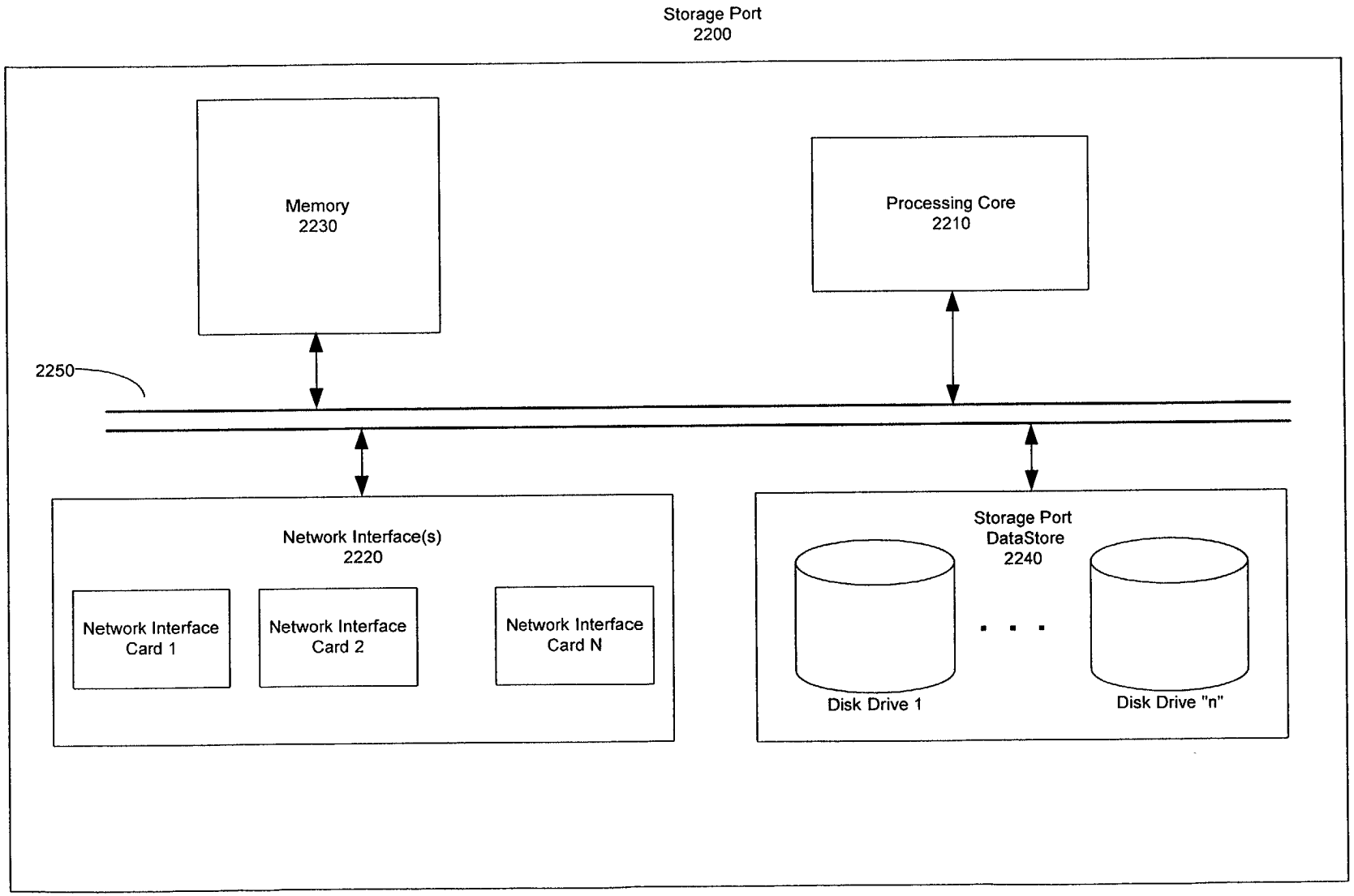

Storage Port
2200
Memory
2230
Processing Core
2210
2250
Network Interface(s)
2220
Network Interface
Card 1
Network Interface
Card 2
Network Interface
Card N
Storage Port
DataStore
2240
Disk Drive 1
Disk Drive "n"

Figure 22

09752441.120500

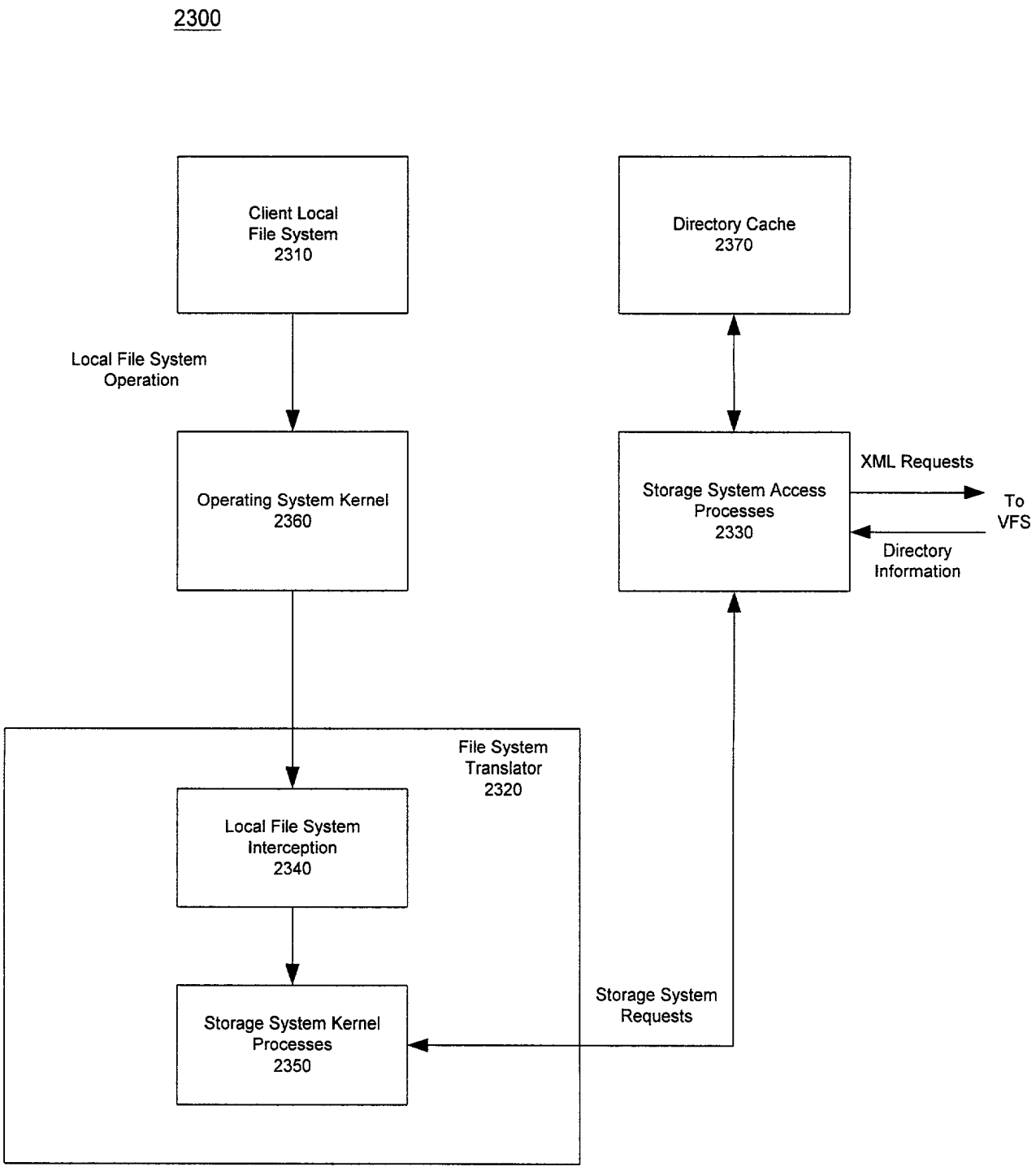


Figure 23

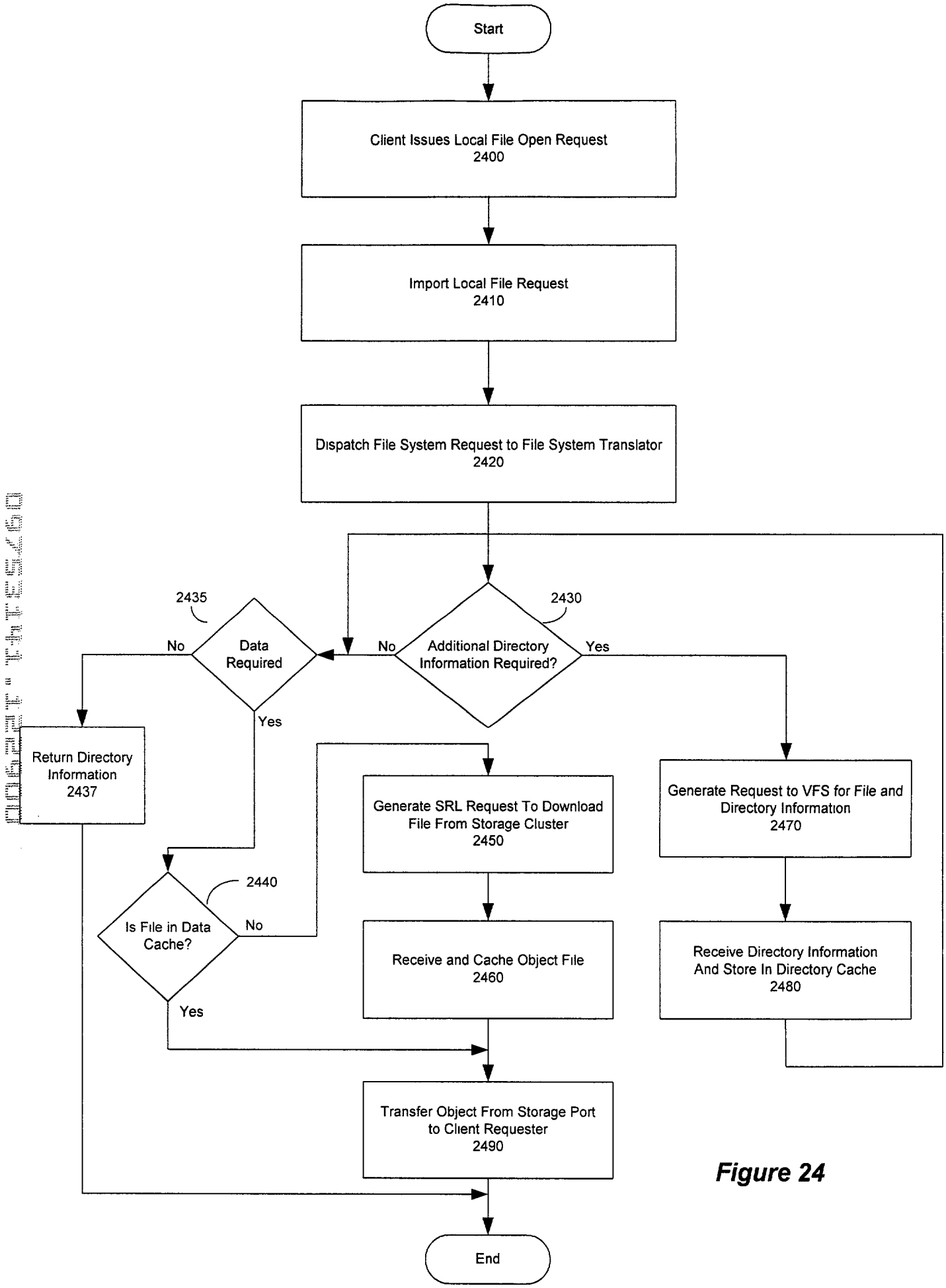

Start
Client Issues Local File Open Request
2400
Import Local File Request
2410
Dispatch File System Request to File System Translator
2420
2435
Data Required
No
Yes
2430
Additional Directory Information Required?
No
Yes
Return Directory Information
2437
Generate SRL Request To Download File From Storage Cluster
2450
Generate Request to VFS for File and Directory Information
2470
2440
Is File in Data Cache?
No
Yes
Receive and Cache Object File
2460
Receive Directory Information And Store In Directory Cache
2480
Transfer Object From Storage Port to Client Requester
2490
End

Figure 24

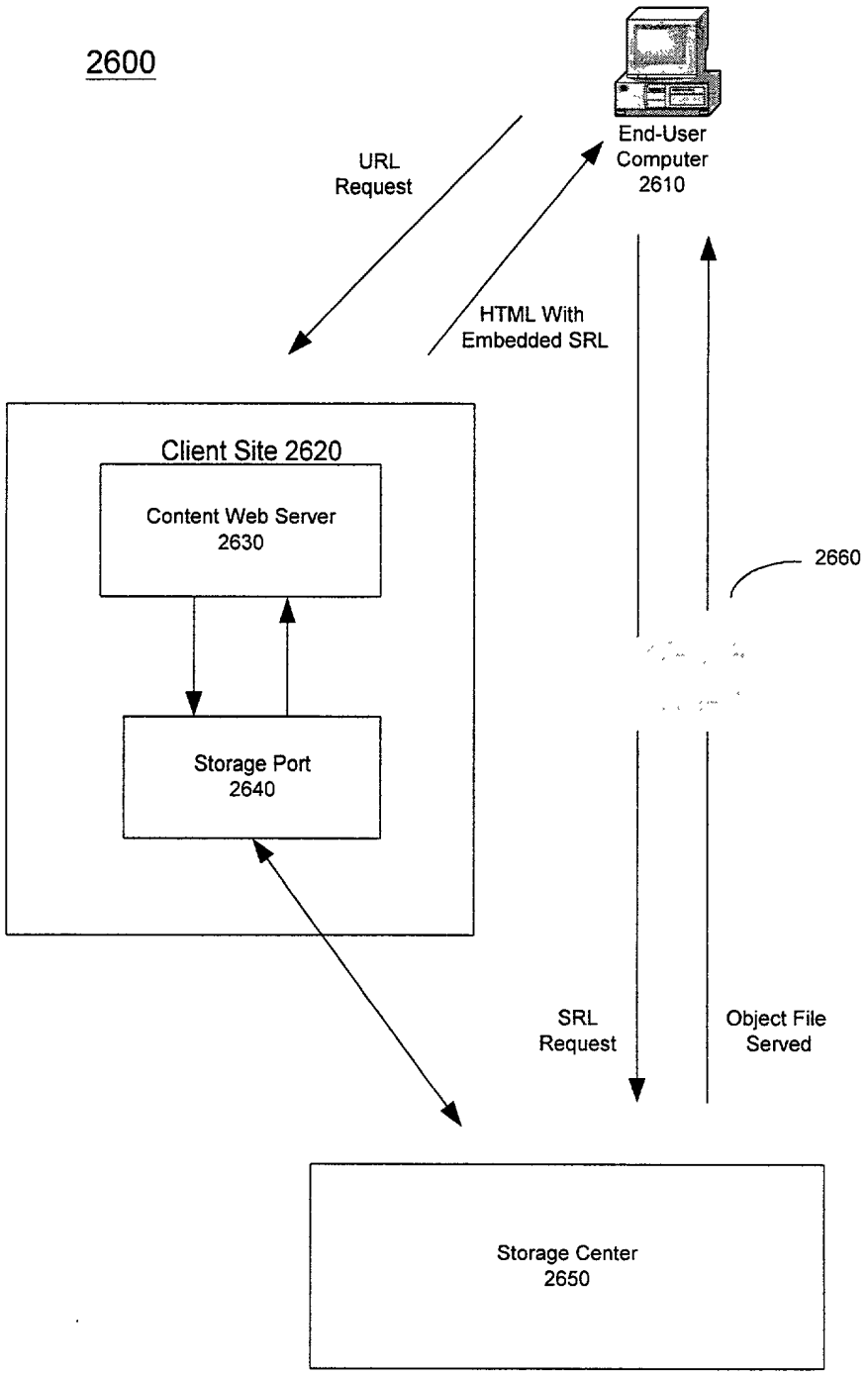

2600
End-User
Computer
2610
URL
Request
HTML With
Embedded SRL
Client Site 2620
Content Web Server
2630
Storage Port
2640
2660
SRL
Request
Object File
Served
Storage Center
2650

Figure 25

Docket No. 4100.00

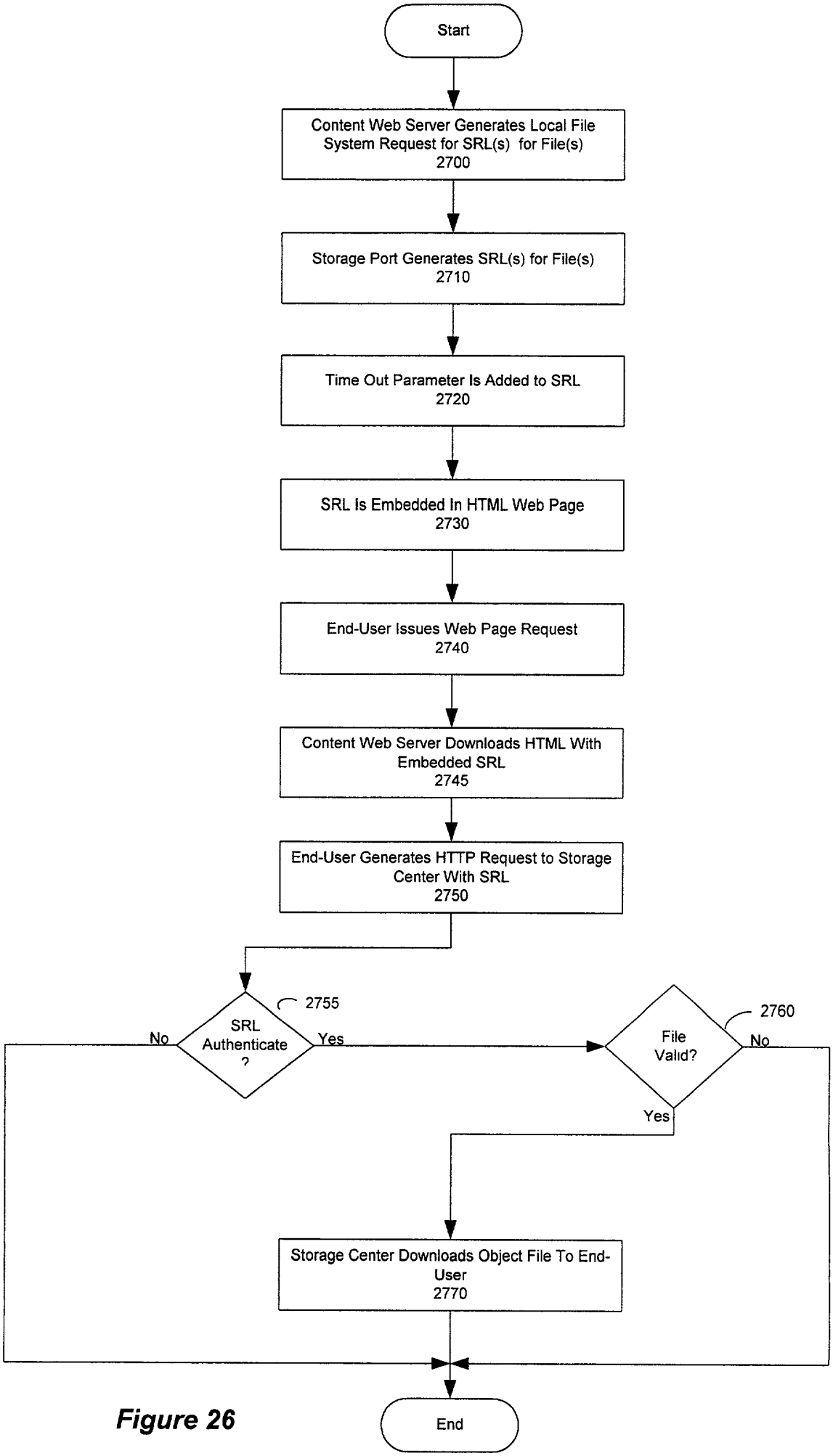


Figure 26

09754144 - 060100

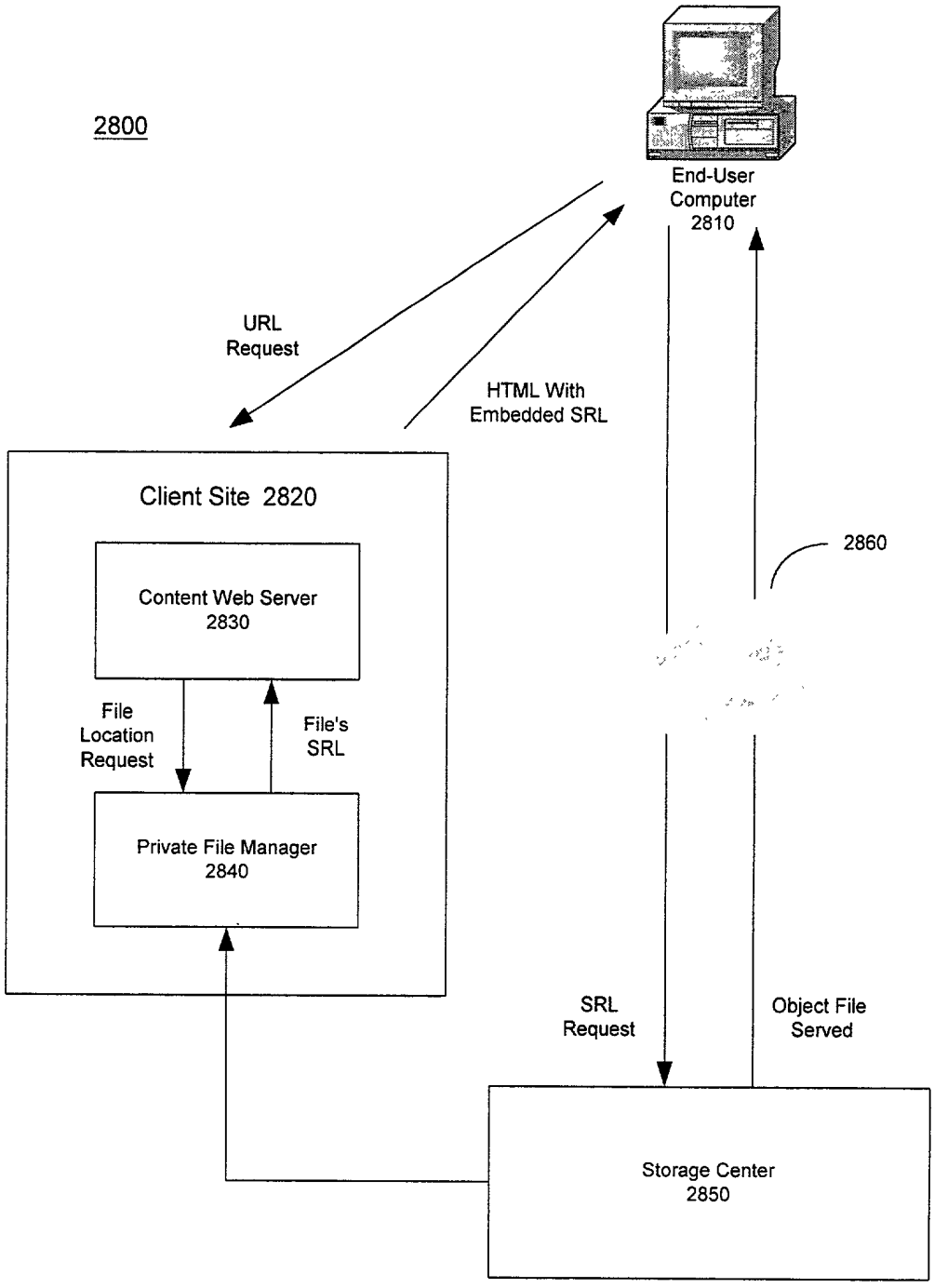


Figure 27

9955444-120905

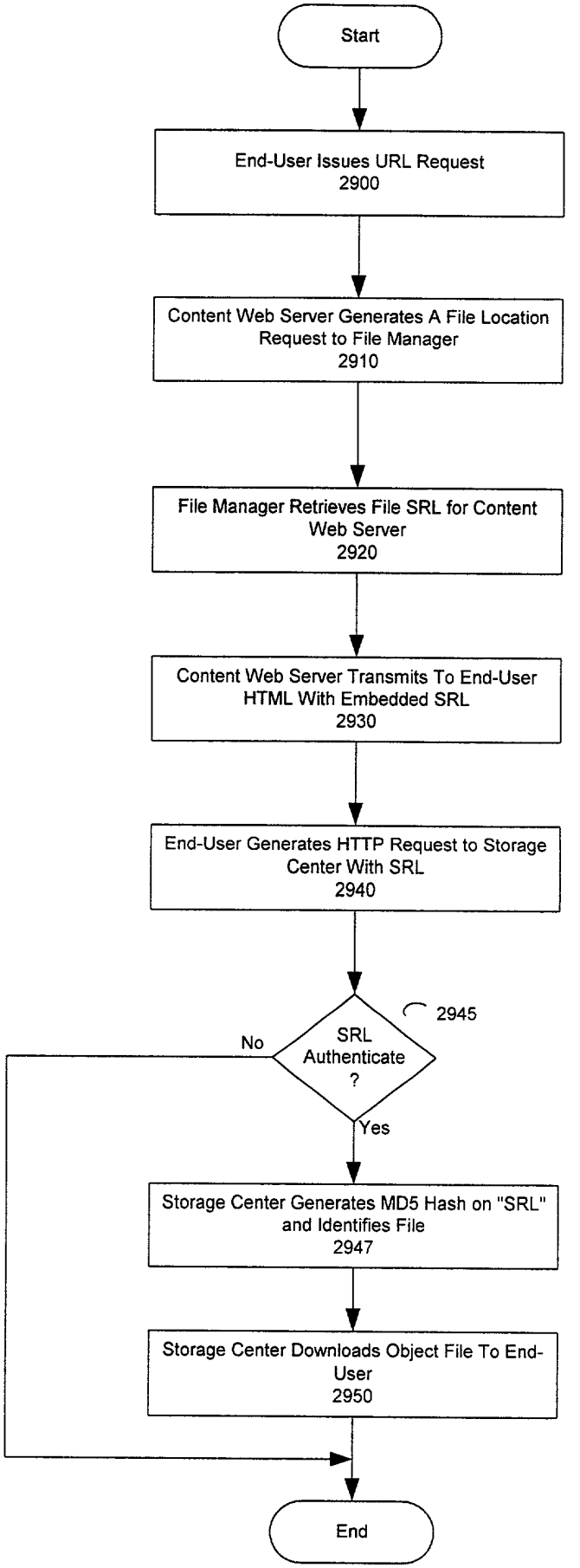


Figure 28

0622T" THES260

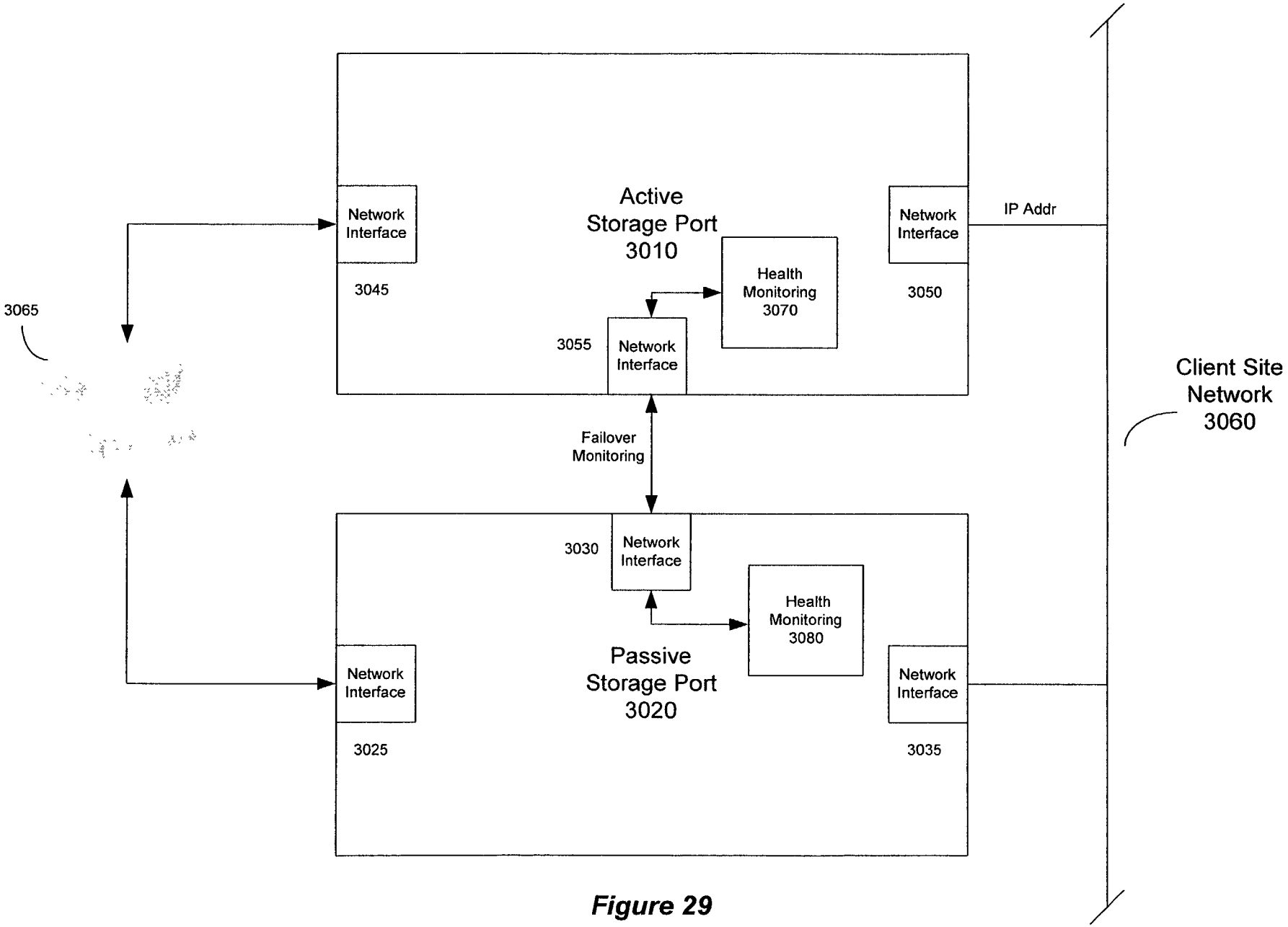


Figure 29

DOCKET NO. 14756.008

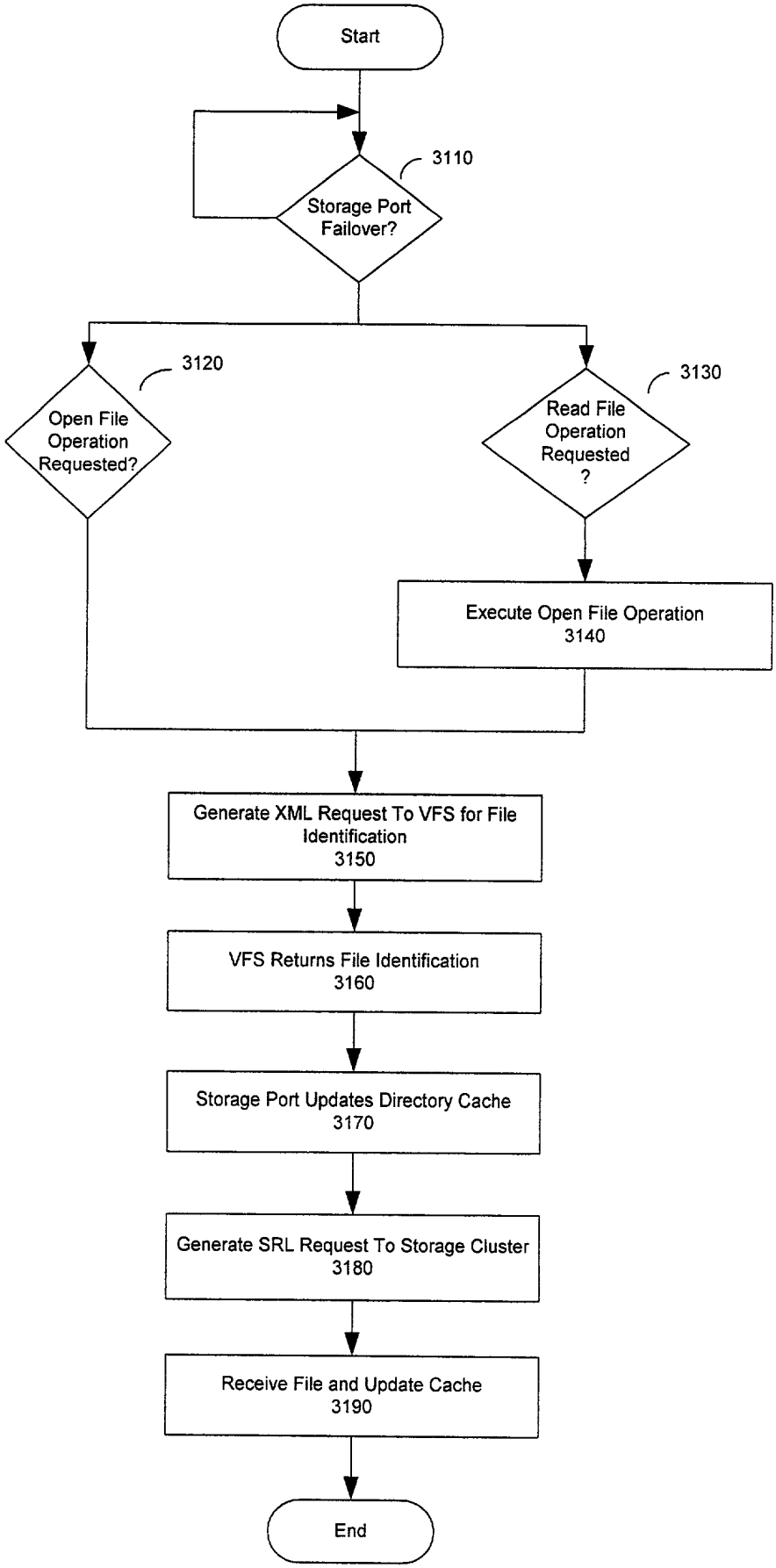


Figure 30

DOCKET NO. 34936

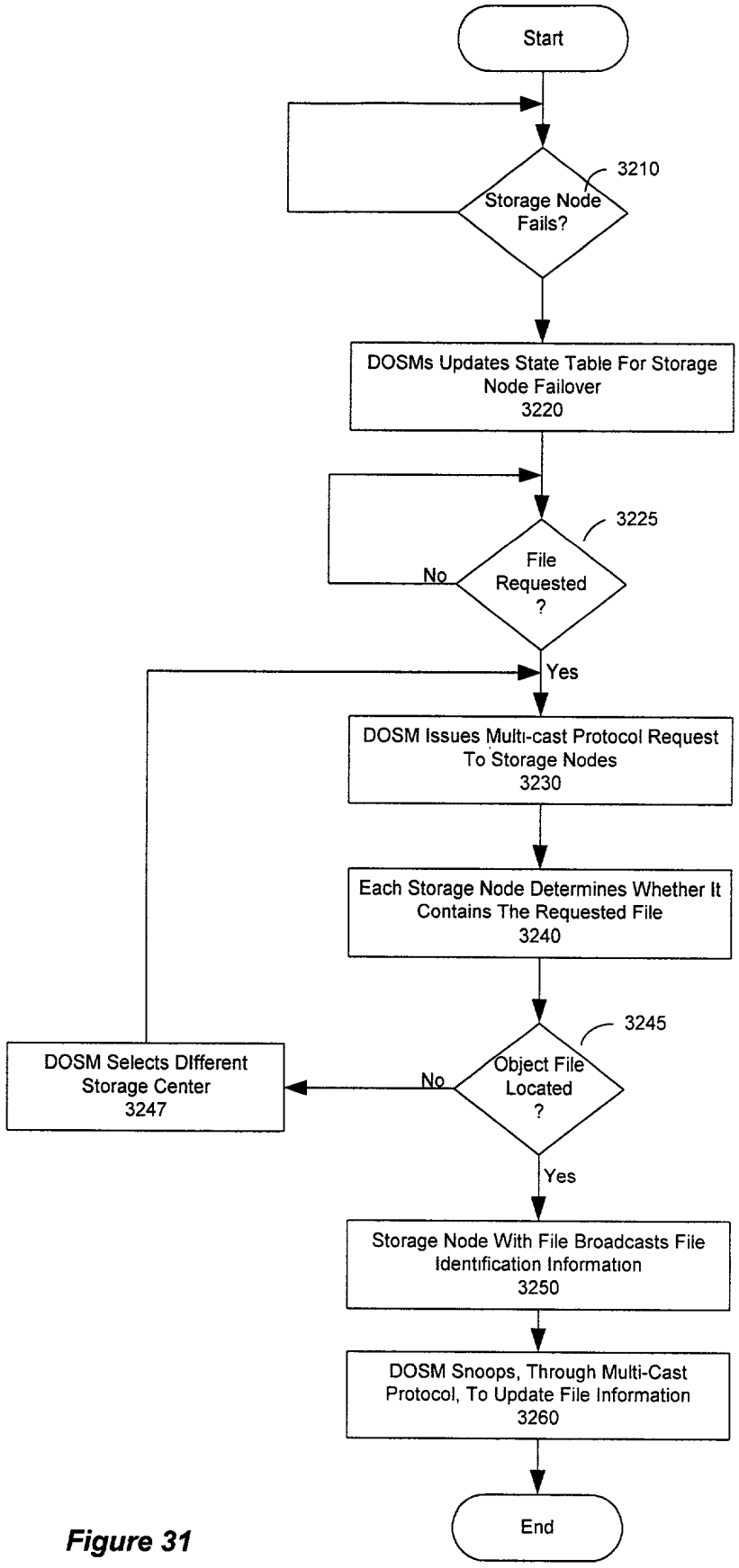


Figure 31